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1971

Volume III

AREA REPORTS: INTERNATIONAL

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UNITED STATES DEPARTMENT OF THE INTERIOR • Rogers C. B. Morton, Secretary

BUREAU OF MINES • Elburt F. Osborn, Director

Created in 1849, the Department of the Interior—America's Department of Natural Resources—is concerned with the management, conservation, and development of the Nation's water, wildlife, mineral, forest, and park and recreational resources. It also has major responsibilities for Indian and Territorial affairs.

As the Nation's principal conservation agency, the Department works to assure that nonrenewable resources are developed and used wisely, that park and recreational resources are conserved for the future, and that renewable resources make their full contribution to the progress, prosperity, and security of the United States—now and in the future.

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Foreword

This edition of the Minerals Yearbook marks the 90th year in which an annual report on the minerals industry has been published by the Federal Government. This edition provides a statistical record on global mineral industry performance during 1971, and contains sufficient background information to interpret the year's developments. The general content of the individual volumes is as follows:

Volume I, Metals, Minerals, and Fuels, contains chapters on virtually all metallic, nonmetallic, and mineral fuel commodities important to the domestic economy. In addition, it includes a general review chapter on these industries, a statistical summary, and chapters on employment and injuries and on technologic trends.

Volume II, Area Reports: Domestic, contains chapters on the mineral industry of each of the 50 States, the U.S. island possessions in the Pacific Ocean and the Caribbean Sea, the Commonwealth of Puerto Rico, and the Canal Zone. This volume also has a statistical summary chapter, identical with that in Volume I, and a chapter on employment and injuries.

Volume III, Area Reports: International, presents the latest available mineral statistics for more than 130 foreign countries and discusses the importance of minerals to the economies of these nations. A separate chapter reviews minerals and their relationship to the world economy.

The continuous effort of the Bureau of Mines to improve the value of the Yearbook for its users can be aided by comments and suggestions. Toward that end, the constructive comments and suggestions of readers will be welcomed.

ELBURT F. OSBORN, *Director*

Acknowledgments

The Bureau of Mines gratefully acknowledges the statistical data and other basic information on mineral production, consumption, and trade which were provided by various foreign government mineral and statistical agencies and which were used in preparing this volume. Data were also obtained from publications of the United Nations, from airgrams of the Department of State, and from both the, domestic and foreign trade and technical press. Particularly helpful in preparing Volume III were the routine and special reports received from the mineral, petroleum, economic, and technical attachés and other members of the embassy and consular service of the Department of State, and their contributions are appreciaed.

The individual country chapters of this volume were prepared by the staffs of the Divisions of Ferrous Metals, Fossil Fuels, Nonferrous Metals, and Nonmetallic Minerals of the mineral supply activity, with some contributions from various members of the Foreign Service. The summary chapter "Minerals in the World Economy" and the production and trade tables of the country chapters were prepared in the Geographic Statistics Group of the Office of Technical Data Services. Final correlation and checking of this volume were performed by the Minerals Yearbook staff of the Office of Technical Data Services.

The regimes of some of the countries reviewed in this volume are not recognized by the U.S. Government. The information contained herein is technical and statistical in nature and is not construed as conflicting with or contradictory of U.S. policies toward these countries.

ALBERT E. SCHRECK
Editor-In-Chief

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Minerals in the World Economy

By Charles L. Kimbell [1] and George A. Morgan [1]

In 1971, the mineral industry, the source of virtually all energy requirements and the bulk of the nonenergy raw materials base for world industrial and economic activity, continued to register gains in production, trade and consumption of most major commodities as the planet's expanding population pursued their goals of an ever-higher standard of living. Overall world total industrial output, as measured by the United Nations' index of industrial production, advanced by 4.4 percent in 1971 over the 1970 level,[2] a growth rate that was measurably exceeded by the growth rate evidenced for several major mineral commodities in data compiled from a wide variety of sources by the Bureau of Mines. However, a number of major commodities also fell short of the indicated industrial growth rate. Among the major crude mineral products, crude oil, marketed natural gas, bauxite, potash, manganese ore, and chromite registered production gains in excess of the indicated industrial growth in world industrial output, but output of mine copper, iron ore, phosphate rock, mine lead, and mine zinc failed to advance at as rapid a rate as overall industrial production. Among major primary manufactures, aluminum alone showed a growth substantially over the industrial output growth, with pig iron, crude steel, hydraulic cement, smelter copper, sulfur, and phosphate rock registering production growth rates below that of industry as a whole and smelter zinc recording a decline in production for the second year in a row.

Although comprehensive data on world trade in mineral commodities during 1971 was not available at this writing, information at hand assures that the levels of trade reached in 1970 were exceeded in 1971. Preliminary figures on trade in crude oil, the overwhelmingly dominant single mineral commodity traded (on both a tonnage and value basis), indicate that 1971 shipments advanced by 6.8 percent to about 1,103 million metric tons in 1971,[3] and trade in refined petroleum products increased by 9.1 percent between 1970 and 1971, reaching 251 million tons.

Rather following the pattern of a slowing rate of production growth, increases in consumption of mineral raw materials were much more modest than in most recent past years, with the exception of liquid and gaseous energy commodities (coal advanced only marginally).

Price rises, although noted for some commodities, were more in keeping with inflationary trends than the result of materials shortages.

The two major areas of international hostilities—Southeast Asia and the Near East—continued to influence mineral commodity supply patterns in 1971. In Southeast Asia, continued reductions in U.S. troop commitments apparently led to a modest reduction in fuel requirements for military purposes, but the overall demand level remained far higher than the modest civilian requirements of the area. In the Near East, despite the absence of major military efforts, continued closure of the Suez Canal as a route of mineral commodity (chiefly oil) movements to Europe remained a factor in the European oil price, although continued expansion of supertanker fleets partially compensated.

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[1] Physical scientist, Office of Technical Data Services.

[2] The United Nations' index of world industrial production for 1971, as reported in the United Nations Monthly Bulletin of Statistics for August 1972 stood at 166 (base 1963=100), seven index points higher, or 4.4 percent above the 1970 level recorded in the same source.

[3] British Petroleum Co. Ltd. Statistical Review of the World Oil Industry 1971. London, 1972, 24 pp.

PRODUCTION

The value of world crude mineral production in 1971 was estimated at roughly $101,700 million, topping the $100,000 million mark for the first time and about $3,400 million over the revised 1970 estimated level of $98,300 million. The apparent growth pattern of world crude mineral output in recent years is summarized in the following tabulation:

Year	Value of 53 major crude mineral commodities [1]	Value of all crude mineral commodities [2]
1950	37,224	42,100
1963	67,042	75,800
1968	77,908	88,000
1969	82,100	92,800
1970	87,000	98,300
1971	90,000	101,700

[1] For details on commodities included see 1970 edition of this chapter, table 5. Figures presented for 1950 through 1968 are those reported in Annales des Mines, No. 1, January 1971, p. 14; figures for subsequent years are extrapolated on the basis of the United Nations' index of world extractive industry output (see table 1 of this chapter).

[2] Data presented here are extrapolated from those in the first column of this table to compensate for commodities not included in the original source study. For details on the basis for extrapolation, see the 1970 edition of this chapter, under "Value of World Mineral Production."

Although the foregoing figures represent only crude estimates of world crude mineral output value, based in part on some assumptions that may not prove to be fully valid, the general pattern is regarded as reasonably reliable. There was quite evidently a pronounced decline in the growth rate in 1971 over that which had prevailed during 1968–70. Some details on this slump are provided in the next section of this chapter.

As in the past, comprehensive, statistically consistent data on the value added by processing of the crude mineral commodities in mineral industry plants of the various nations are not available, but for 1971, a very crude estimate of about $230,000 million is regarded as conservative.

PRODUCTION INDEX PATTERNS

United Nations' production indices for the world's mineral industry (excluding that of Communist Asia) are presented in table 1, together with more detailed index figures for major sectors of the industry and for selected major geographic areas. This series, using 1963 performance as the base reference point, indicates that for the mineral industry as a whole on a worldwide basis, there was a general increase in 1971 with respect to 1970 performance, but that the growth rate reflected by comparison of the 1971 level with that of 1970 was considerably lower than those registered in 1970 and 1969.

Reviewing the world index numbers from the viewpoint of the general industry sectors listed, metal mining registered a performance on a par with that of 1970, and base metal processing recorded a fractional decline. The other listed sectors registered gains over the 1970 levels, but in contrast to the situation in 1970, only the categories of nonmetallic mineral products and chemical, petroleum and coal products recorded increases that on a percentage basis exceeded that of overall industrial production for 1971. Extraction of coal and production of petroleum and natural gas registered lower growth rates than did industry as a whole.

Examining 1971 growth of the world's mineral industry in terms of performance during the year itself, the total extractive sector registered a modest gain between the last quarter of 1970 and the first quarter of 1971, a gain which continued through the second quarter of 1971 followed by a pronounced third-quarter slump and a modest fourth-quarter recovery. The overall extractive industry pattern was not matched by that of any of its three subdivisions, however. Metal mining showed a decline between the last quarter of 1970 and the first quarter of 1971, a significant advance in the second quarter and a gradual decline thereafter; coal mining registered a small increase in the first quarter of 1971 over the last quarter of 1970, then declined through the second and third quarters (an almost traditional slump associated with reduced coal requirements in northern hemisphere consuming centers during their summer months), but failed to register an expected increase in the fourth quarter, holding on a par with third quarter performance. The extraction of petroleum and natural gas increased in the first quarter of 1971 relative to the last quarter of 1970, then declined slightly in the second quarter, more sharply in the third quarter and then reversed, registering a marked gain in the fourth quarter. In the case of the processing sectors, base metal processing registered gains from the fourth quarter of 1970 through the second quarter of 1971, then slumped sharply (15 index points) and rallied in the fourth quarter but failed to regain the level registered at the start of the year. Nonmetallic mineral products registered a decline in the first quarter of 1971 compared with the last quarter of 1970, then showed a substantial gain in the second quarter, a moderate decline in the third quarter, and a partial recovery in the last quarter. Chemicals, petroleum, and coal products recorded consistent gains from the end of 1970 to the end of 1971 except for a very minor decline in the third quarter.

Considering relative annual performances by regions, the Communist European countries, recorded gains in all industry sectors in 1971 compared with 1970 results, while the non-Communist countries as a whole showed declines in metals and coal extraction, and base metal processing, with all other sectors advancing. Space does not permit detailed discussion of all non-Communist world production trends on the basis of individual country groups within that broad category, but it should be clear from table 1 that the various component country groups under each of the major industry sectors varied quite widely in their performance, not necessarily following the overall trend for non-Communist countries. For example, in the case of metal mining, the overall non-Communist world registered a modest decline from 1970 to 1971, but the nations of the European Free Trade Association, Australia-New Zealand, and the less-developed countries of Asia showed substantive gains in 1971 while the Latin America, European Economic Community, and United States-Canada groups showed declines. Only in the case of coal extraction did the indexes for all non-Communist country subgroups listed register declines, following the non-Communist world overall index. Another notable regional departure from the non-Communist world average was in the case of Latin America crude petroleum and natural gas, which recorded a decline from 1970 to 1971 in the face of a general non-Communist world increase.

Among the groups of mineral processing indexes, it is worthy of note that in the case of the base metal industry, the less industrialized non-Communist countries of Latin America and Asia registered gains in metal processing between 1970 and 1971, while the major industrialized non-Communist areas recorded lower output in 1971 (except Australia-New Zealand, which showed no change). The nonmetallic minerals processing industry recorded gains in every non-Communist area listed, as did the chemical, petroleum and coal products industry, but growth rates varied widely from region to region.

It should be stressed that although the Communist areas in most recent years have shown consistently higher production index numbers for most mineral industry sectors then have the non-Communist nations, the comparison of growth rates alone presents far from the whole story. The gains registered are those over the performance levels for the industries in 1963, and in order to appreciate the real performance of industries in the various areas, one must consider the relative levels of output in 1963, for the gains of the Communist nations are from a lower base level in terms of quantitative output of most commodities. The same is true when comparing the growth rates of different regions among the non-Communist nations. Most notable in this respect is the growth of Australia-New Zealand in metal mining, almost entirely the result of the development of substantial Australian export industries for iron ore and bauxite during the 1960's.

QUANTITATIVE COMMODITY OUTPUT

Table 2 summarizes total world output of a number of mineral commodities for 1969–71; table 3 gives the regional distribution of 1971 output of these commodities in terms of percent of world total. Tables within the statistical summary section of this chapter provide details on distribution of output of selected major commodities by principal producing countries for 1969–71.

Nonfuel Mineral Commodities.—Of the 39 metallic mineral commodities listed in table 2, 21 registered increases in production in 1971 compared with 1970 results, and declines were registered for the remaining 18.

Among the 22 industrial nonmetallic

mineral commodities for which output data are listed in table 2, 14 showed higher production levels in 1971 than in 1970 and 8 registered declines.

Tables 32 to 50 in the statistical summary section of this chapter give details on output of selected major nonfuel mineral commodities (both metals and nonmetals) by major producers for 1969–71.

Mineral Fuel Commodities.—Preliminary data indicate that world production of energy commodities in 1971 reached a new high in terms of standard coal equivalent (SCE), as output of all major crude mineral fuels reached new production highs. World output of commercial energy commodities[4] totaled 7,219 million tons SCE, compared with nearly 6,843 million tons in 1970 and 6,413 million tons in 1969. Each of the commercial energy sources listed in table 2 registered new record highs in 1971; previous record highs for all had been the 1970 levels. In 1971, for the fifth consecutive year, crude oil ranked as the leading source of energy on a percentage basis, and continued to increase its share of the total, as natural gas remained at its 1970 level in terms of share of total energy production. Coal declined to 33.9 percent of total energy production, while hydro-geothermal-nuclear power increased slightly as shown in the following tabulation:

Energy source	Share of total energy production (percent)		
	1969 [1]	1970 [1]	1971 [2]
Coal (including lignite)	36.8	35.3	33.9
Petroleum	40.7	41.7	43.0
Natural gas	20.2	20.7	20.7
Hydro, geothermal, and nuclear electricity	2.3	2.3	2.4
Total	100.0	100.0	100.0

[1] Based on data in United Nations. World Energy Supplies 1961–70. Statistical Papers, Series J, No. 15, New York, 1972, p. 11.

[2] Estimate, based on extrapolation of United Nations data for 1970 using world production data for listed commodities reported to and published by the U.S. Bureau of Mines.

Among the energy products listed in table 2, which include not only the primary energy sources but such processed items as coke and fuel briquets (mainly from coal), available 1971 output data show gains for coal, natural gas and crude oil, while the processed items registered declines. Tables 48, 49, and 50, respectively, give output of coal, natural gas, and crude oil, for 1969–71 by major producing countries.

TRADE

GENERAL TRENDS

The aggregate value of world mineral commodity trade in 1971 probably exceeded that of any previous year, but at perhaps a lower percentage increase. Data available at this writing were not sufficiently complete to provide an estimate of the 1971 level. However, in 1970, the latest year for which data are complete, the estimated aggregate value of $83,533 million of mineral commodity trade exceeded the 1969 estimate by $12,143 million, an increase of 17 percent. This represents the largest increase recorded over a 12-month period in any recent year, and reverses the previous years' decrease in growth rate. In terms of major mineral commodities' share of all commodities traded, mineral commodities in aggregate accounted for an estimated 26.8 percent of the total, compared with 26.2 percent for 1969, as indicated in the following tabulation:

Year	Estimated value of all mineral commodities traded [1] (million dollars)	Increase relative to previous year (percent)	Mineral commodities' share of all commodities traded (percent)
1966	53,070	6.4	26.1
1967	56,540	6.5	26.4
1968	63,550	12.4	26.6
1969	71,390	12.3	26.2
1970	83,533	17.0	26.8

[1] Value estimated from data on mineral commodities appearing in table 4, to which have been added a factor for all mineral commodities not included in that table. The factor added is based on comparison of complete mineral trade value returns for selected countries with data given for these same countries in the source for table 4, which includes only the selected mineral commodity groups specified in the footnotes to that table. This comparison indicates that the recorded mineral commodities listed in table 4 represent about 81.5 percent of total mineral commodity trade.

When contrasted with the previous years' total of world trade in mineral commodities, it was apparent that developed market economies showed the greatest gains in value of trade, both on a percentage basis and in terms of number of dollars. The developed countries apparently caught up with the processsing of mineral commodities that had resulted from previous expanded output of less industrialized or developing nations. The increase is attributable to the greater flow of mineral semimanufactures from developed countries to less industrialized nations, with the latter's requirements for such materials increasing with expanded production of ores and fuels. The rise in the value of mineral commodity trade is also due to the continued climb of unit prices paid for these minerals.

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[4] Excludes wood, charcoal, bagasse, animal dung, peat, and other minor fuels, although such fuels are used as commercial fuels in some countries, and in a few nations, account for a significant part of total energy consumption.

COMMODITY GROUP TRADE PATTERNS

A comparison of the value of total world mineral commodity export trade for 1966–70 in terms of the five major mineral commodity groups is available in table 4. It is apparent that since 1966 a steady increase has occurred in the total value of each commodity division traded, with considerable variation in the proportion of total major mineral commodity trade accounted for by each of the principal groups of these commodities (table 5); such differences are due to varying growth rates as given in table 6. Crude nonmetals continued to account for a declining proportion of total major mineral commodity trade, reaching their lowest proportion of the total in 5 years. Ores, concentrates, and scrap again showed a higher percentage of the total, that commodity group registering the second highest growth rate of any major group. In 1970, iron and steel accounted for 25 percent of the total value of mineral commodity export trade. That commodity group continued to exceed the previous year's rate of growth, registering a 24.7 percent growth rate in 1970. Though showing a growth rate of 15.1 percent in 1970 over the 7.8 percent recorded in 1969, mineral fuels continued to decline in share of total mineral commodities, reaching a lower level than any recorded since 1967. However, these percentage differences are small, and mineral fuels are still the dominant group in terms of share of major mineral commodity trade.

The growth in value of export trade, as indicated in table 6, continued to show a general increase in the rate of growth of all major classes of mineral commodities except nonferrous metals, which registered a 10.4-percent rise in 1970, compared with 15 percent in 1969. The aggregate of the five major mineral commodity groups showed a growth in value of export trade of 17 percent for 1970, higher than any previous year recorded. In comparing the level of growth of the aggregate of major mineral commodity groups with the growth level of that recorded for total commodity export trade in 1970, major mineral commodities showed a considerably larger gain; 17 percent indicated above compared with 14.2 percent for all commodities. This reverses the pattern existing in 1969, again placing growth of aggregate mineral commodities ahead of growth of all commodity export trade, and reflecting the higher growth rates in mineral fuels, and ores, concentrates, and scrap.

REGIONAL TRADE PATTERNS

Geographic distribution of world trade in major mineral commodity groups (metal ores, concentrates and scrap, iron and steel, nonferrous metals, nonmetals, and mineral fuels) in terms of dollar value is indicated in tables 7, 8, and 9 for 1970, the latest year for which complete data are available. Table 7 represents the comparison of the aggregate of major mineral commodity trade to trade in all commodities in terms of exports from and exports to the regions and countries listed. Thus it shows the relative importance of total major mineral commodity export trade for the world and those geographic areas indicated. A more detailed breakdown of export origins and destinations of the five individual major commodity groups by area of the world and country is indicated in table 8, reflecting to some extent regional self-sufficiency or dependence for each commodity group. Finally, table 9 shows the direction of flow of the aggregate value of major mineral commodity trade by selected country and region in matrix form.

Distribution of 1970 world trade in major mineral commodities in terms of developed and developing market economies and centrally planned economies is indicated in the following tabulation:

Destination [1]	Sources of exports [1]			
	Market economy countries		Centrally planned economies	Total
	Developed [2]	Developing [2]		
Value in million dollars:				
To market economy countries:				
Developed	28,517	20,545	2,373	51,435
Developing [2]	4,917	4,868	583	10,368
To centrally planned economy countries	1,536	437	4,304	6,277
Total	34,970	25,850	7,260	68,080
Share of world total in percent:				
To market economy countries:				
Developed	41.9	30.2	3.5	75.6
Developing [2]	7.2	7.2	.8	15.2
To centrally planned economy countries	2.3	.6	6.3	9.2
Total	51.4	38.0	10.6	100.0

[1] Sources and destinations grouped according to United Nations' practice; developed market economy countries are: Australia, Austria, Belgium, Canada, Denmark, Finland, France, West Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portgual, Republic of South Africa, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States, and Yugoslavia; centrally planned economy countries are: Albania, Bulgaria, People's Republic of China, Czechoslovakia, East Germany, Hungary, North Korea, Mongolia, Poland, Romania, U.S.S.R., and North Vietnam; developing market economy countries include all countries not specifically listed previously in this footnote.

[2] Previous editions of this table contained the headings industrialized and less developed, which have since been retitled as indicated in the present tabulation.

Data from the above tabulation continue to demonstrate the pattern set in 1969. The developing market economies, (formerly termed "less developed market economies"), as well as the centrally planned economies again recorded a decline in their share of the total of world trade in exports, registering 38 percent and 10.6 percent, respectively, for 1970, compared with 39.1 percent and 11.3 percent for 1969. In contrast, developed market economies (formerly termed "industrialized market economies") registered a substantial gain in the share of world trade in exports of major mineral commodities, 51.4 percent in 1970, compared with 49.6 percent in 1969. These same countries accounted for only a slightly smaller share of export receipts (75.6 percent in 1970; 76.8 percent in 1969). However, it should be noted that, though the percentage share of the world total declined for developing and centrally planned economies, the actual value of all entries in the tabulation increased. It also appears that most of the trade indicated continued to be between the developed market economies; the shares of receipts to developing market economies and centrally planned economies were 15.2 percent and 9.2 percent, respectively, in 1970 (14 percent and 10.8 percent in 1969.)

Table 7 illustrates the marked disparity between regions in the share of total regional commodity exports accounted for by the major mineral commodities. In the Near East, largely as a result of its oil exports, the major mineral commodities accounted for 85.3 percent of total commodity exports. Other areas registering very high shares of total commodity trade accounted for by minerals include those nations classified as "Not reported" with 49.3 percent; other Africa (Africa excluding the Republic of South Africa), with 51.9 percent; and Latin America with 42.3 percent. All of these areas, except for "Not reported," show higher percentages than were recorded for the previous year. Countries and areas whose major mineral commodities accounted for the lowest share of total commodity trade were the United States, with 11.8 percent, and Communist Asia, which registered 6.3 percent; both up from their 1969 levels. In the case of the Republic of South Africa, it should be noted that the 11.6 percent share of total commodity trade reported in the table is based on mineral fuels and nonmetals only, and thus is not indicative of this nation's true position. Addition of value data for gold, not included in any figures for commodity trade, and of unreported data for South

Africa's substantial exports of diamond and a variety of metals would raise the percentage appreciably.

In considering table 7, it should be noted that most of the trade values indicated for Europe were taken from a source different from that from which the balance of the table was derived. This is because values in the primary source for certain commodities were apparently in error. Study of the receipt column ("Exports to") under the heading of "Major mineral commodities' share of total" shows that the variation between areas in percent of total imports accounted by major mineral commodities was considerably less than the variation in percents for exports. Japan, as in 1969, again ranked well ahead of other specifically identified minerals accounting for 36.5 percent of total commodity trade. The percentage of total commodity trade accounted for by major mineral commodities was 21.9 percent for all countries and regions in 1970, compared with 21.3 percent in 1969. Most industrialized nations registered approximately 21 percent of their total receipts as major mineral commodities, with the exception of Canada, Republic of South Africa, and Australia-New Zealand. These nations, because of low population densities and sizable undeveloped mineral resources, more closely follow the import patterns of the developing areas, with major mineral commodities accounting for 11 to 15 percent of total commodity export receipts. In 1970 Communist Europe and Communist Asia received export shipments accounting for 19.5 percent and 24.8 percent, respectively, of export receipts. As in the past year, these data are more nearly the result of a low level of nonmineral commodity imports rather than from the receipt of substantial quantities of major mineral commodities.

Table 8 indicates the relative importance of individual mineral commodity groups' export and import trade for selected regions and countries. Comparison with the equivalent table for 1969 data shows that the most significant changes occurred in European exports and imports of iron and steel and imports of mineral fuels. As in the past, exports from the Near East producers of mineral fuels also showed considerable gain. No data for 1970 appears for metals for the Republic of South Africa, and figures are excluded for nonmetals for Latin America, the Near East, South Asia and the Far East, and Australia-New Zealand. Because a portion of these figures are presumably included under "Not reported" and thus do increase the world total to an appropriate level, the importance of these commodities to the specific countries or areas is not shown. Gold is also excluded as in previous years because of the system of reporting used, Standard International Trade Classification Revised (SITC-R).

Destinations of the aggregate of major mineral commodities is given in table 9 and requires little explanation other than to note that for two countries, Canada and Japan, the summation of exports to the regions indicated exceeded the grand total by the amounts listed in the footnotes. Also apparent is that no destinations for Republic of South Africa trade in major mineral commodities are available, except where value indicated for "Rest of world" was taken from the grand total obtained from the source.

All tables relating to this section have value entered based on the valuation of the materials as reported and exclude shipping costs. Comparison of the total export shipment credited to each country or region (vertical grand total column on last page of table) with total export receipts (horizontal grand total line at the bottom of each page of the table) will indicate the relative position of each area as a net importer or net exporter of major mineral commodities.

CONSUMPTION

NONFUEL MINERAL COMMODITIES

Despite the lack of data for all commodities, world consumption of most nonfuel mineral commodities, metals, and nonmetals in terms of gross tonnage advanced slightly in 1971, based on the performance of selected major metals and nonmetals. However, consideration of individual commodities indicates that consumption of iron ore, the major ore of the metallurgical industry, was down from the 1970 total by 2.2 percent. The 1971 iron ore consumption figure of 589 million tons represents the total of 21 nations (table 10), including all major world producers of pig iron except the People's Republic of China, and is based on iron ore consumption in agglomerating plants, blast furnaces, and steelmaking. It should be noted that the 1971 consumption given is compiled in some part on estimates. Of the total iron ore consumed, about 7 million tons was used directly in steelmaking; approximately 40 percent of the iron ore was treated in agglomerating plants prior to being fed to blast furnaces; the balance, amounting to over 57 percent of the total, was fed to blast furnaces and other facilities for production of pig iron and other products with or without agglomeration.

Paralleling the situation in iron ore was the world consumption of iron and steel scrap. However, insufficient information necessitated the estimation of totals for several of the 23 countries listed in table 11. Nonetheless, data now available indicates that 1970 world scrap consumption was 262 million tons, a revision of the 264 million published in the previous edition of this chapter. The revision indicates a slight decline in scrap consumption over the high for 1969 rather than an increase as previously reported. The 1971 total is estimated at approximately 247 million tons, again a decline from revised 1970 figures, reflected in part by the exclusions of scrap in particular industries as indicated in the footnotes to table 11.

World consumption data for five selected major nonferrous metals is given in table 12. Except for copper, which declined by less than 1 percent (25,000 metric tons), all metals registered increases over 1970 consumption levels. Aluminum in particular continued to show strong increases; the 1971 total of 10 million tons exceeded the 1970 figure by 801,000 tons. This is double the increase recorded for the 1970 consumption figure of approximately 400,000 tons over 1969. More modest increases were registered for lead, zinc, and tin, with zinc reversing the downward trend begun the previous year. Lead continued the steady increase that has characterized that metal's annual consumption for the past decade, and tin consumption was up modestly over the 1970 level.

Although data on a worldwide basis for consumption of most nonmetallic mineral commodities are not available, it is reasonable to assume that major commodities in this group, limestone, cement, and fertilizer materials, again advanced in 1971. Sulfur, traditionally a major commodity in its own right, appears to be losing its position, as pollution control regulations are enforced and subsequent demand for the commodity is reduced. World consumption of nitrogen fertilizer for the 1970/71 fertilizer year (July 1, 1970–June 30, 1971) was reported at 32 million tons, approximately a 1-percent increase over the previous years' consumption total, but considerably down from the 7.3-percent increase registered in the fertilizer year 1969/70. Substantial increases were also registered for phosphate and potash fertilizer consumption in 1971. Phosphate consumption (contained P_2O_5) increased by 6.7 percent to 21 million tons, and potash consumption in terms of K_2O equivalent increased by 5.1 percent to 17 million tons.[5]

MINERAL FUEL COMMODITIES

In 1970, the latest year for which reasonably complete returns are available, total world consumption of mineral fuels (coal, oil, and natural gas) and primary electric power (that power produced by means other than the burning of the aforementioned fuels) was 6,843 million metric tons SCE. Assuming a similar performance to continue as in the past several years, it may be expected that the 1971 total world energy consumption also increased at a comparable rate. The 1970 level of energy consumption as previously defined increased 6.7 percent over the 1969 level of 6,413 million tons SCE. Table 13 details energy consumption by major source (solid fuels, liquid fuels, natural gas, and primary electric power) and by continental divisions for the years 1966–70 as reported by the Statistical Office of the United Nations. Examination of data in the table indicates that liquid fuels, again as in the past 4 years, were the main source of energy for the total energy consumed, 41.7 percent in 1970, compared with 40.7 percent in 1969. Solid fuels remained second behind liquid fuels, accounting for 35.3 percent of the total.

Despite the status of solid fuels as a greater source of energy than gas, the rate of increase of the latter was considerably larger; 9.4 percent in 1970 compared with a 2.4-percent rate of increase of solid fuels, reflecting the increasing reliance on natural gas as a less expensive (in terms of caloric value and pollutant content) energy source. The growth rate of liquid fuels nearly matched that of natural gas at 9.3 percent over the 1969 total. In terms of total energy consumption, primary electricity accounted for less than 2 percent despite technological advances for harnessing tidal and thermal energy.

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[5] The British Sulphur Corp. Ltd. Statistical Supplement No. 4, November-December 1971, London, 1972.

Analysis of data in table 13 from a regional viewpoint shows little variation from the previous years' distribution. The most notable exception occurred in Western Europe, where higher output and sizable imports of natural gas increased consumption of that commodity by 35 percent. Near East natural gas consumption, although remaining low, nearly doubled in 1970. Solid fuel consumption for Western Europe declined by 3.3 percent, the decrease being more than compensated for by a 13.7-percent increase in liquid fuel consumption and the above mentioned natural gas consumption. Overall comparison of the regions indicated in terms of solid fuel consumption reflects the continued pattern of higher coal utilization by developing areas and in particular the centrally planned economies. Both the European and Asian groups of the centrally planned economy countries increased solid fuel consumption by 3.8 percent and 8.5 percent, respectively. European centrally planned economies increased their levels of consumption of liquid fuels and natural gas, much of the supply of such fuels originating in the U.S.S.R. The Far East accelerated that region's rate of consumption of liquid fuels, 16.5 percent in 1970, compared with 15.7 percent in 1969, again chiefly as a result of Japan's continued industrial growth.

From the viewpoint of per capita consumption, each of the world regions listed recorded gains, indicating more even distribution of world energy consumption. Africa, which showed no change during 1969, edged upward marginally in 1970.

RESERVES, RESOURCES, AND EXPLORATION

In view of recent concern with regard to shortages of mineral commodities and mineral fuel commodities and the impact such shortages may have on energy demand and consumption, it is pertinent to examine several aspects of the reserve situation of several major mineral commodities. Also indicated will be some possible trends and developments that may be concluded from production and consumption of these materials, particularly as they may affect mineral commodity movement.

First, to narrow the range of possible interpretations and to limit the inclusion of deposits that would otherwise cause a misrepresentation of the estimated quantity of reserve of a given commodity, the term "reserve" is used to mean a deposit that is economically recoverable at present prices using current technology. This will exclude low-grade ore deposits or inaccessible deposits, which, with the absence of economical technology for concentrating or exploiting the ore, are relegated to the category of resource. This is to say that such ore deposits, with later advanced retrieval and refining methods and with greater demand and competitive prices on the world market, may enter the reserve category, but for the purpose of maintaining the definition used here they are considered resources. Coal is the most obvious example, with the quantity for anthracite and bituminous given in table 14, certainly to be considered a low estimate if much of the coal currently known to exist in the U.S.S.R. but not usable under the definition given above, were included in the total.

The U.S. Bureau of Mines estimates of world reserves of several major mineral commodities in 1971, distributed by market economy and centrally planned economy countries, with some detail on major countries, are given in table 14. In terms of percentage of the world total reserves of the selected commodities, those of the principal market economy countries indicated, together with those of the centrally planned economies, generally account for over 70 percent of the total. The major exceptions to this generalization are natural gas and sulfur. In the case of natural gas, 625,616 billion cubic feet are accounted for by other unspecified market economy countries, and for sulfur the Near

East countries account for 472 million tons.

The Republic of South Africa and Southern Rhodesia claim the greatest portion of the world's total reserve of chromite, nearly 96 percent. It is worth mentioning at this point that manganese has been excluded due to changes arising from revisions in U.S.S.R. reserves; indications are that the Republic of South Africa may account for a substantially greater portion of the total than previously believed.

As in the case of chromite, over 90 percent of the world reserve total of molybdenum, tungsten, coal (anthracite, bituminous, and lignite), phosphate rock, and potash is distributed among the individual market economy countries indicated and the centrally planned economies. In view of the U.S.S.R.'s position in terms of land mass and estimated reserves of individual commodities, it may be assumed that Soviet reserves account for a substantial portion of the totals under the column titled "Centrally planned economies." Specifically, in the instance of natural gas, approximately 423,000 billion cubic feet of reserve are located in the U.S.S.R. A notable exception is nickel, with Cuba claiming 16 million tons of the world's reserve of that commodity.

Exploration in progress during 1970 and 1971 resulted in discoveries of a number of varied deposits, some indicating substantial reserves that will affect the region's position in the world as a reserve area, as well as the world total of mineral reserves. Brazil, the leading world producer of columbium in 1969 and 1970, claims reserves totaling 300 million tons of the mineral, making it the dominant potential source of that commodity. New Zealand reportedly has located an estimated 50-million-ton gabbro deposit containing substantial quantities of magnetite, ilmenite, and vanadium pentoxide. Further analysis is expected, as well as careful decision making as to the feasibility of exploiting the deposit, particularly since it lies in the heart of Fiordland National Park. Smaller reserves of asbestos, fluorspar, and iron ore have also been claimed by Colombia, Morocco, and Mexico, respectively.

Africa, as has been proven in the past, continues to remain a region of high-yield expectancy of mineral ores. Considerable attention is being focused on Malawi, which appears ripe for discovery of minerals because of the geography of the region and because of the proved and possible reserves in the surrounding countries of Zambia, Mozambique, and Tanzania. Formerly bypassed during exploration booms in Rhodesia and Mozambique, present modest exploration taking place in the Mount Mlanje area indicates reserves of approximately 60 million tons of bauxite ore. Once believed an area too inaccessible, lacking inexpensive power supply, and having faced stiff competition from the discovery of large bauxite deposits in Australia, the time and circumstances make the region much more favorable for exploitation. In addition to the bauxite, deposits of nickel, columbite (pyrochlore), and titanium (ilmenite) are being investigated, as well as the possibility of diamond production from the kimberlite and alluvial areas. A rare earth deposit at Kangonkunde Hill is also being investigated for its monazite and strontianite content. Substantial deposits of apatite have been located at Tundulu, near Mount Mlanje; preliminary estimates show 2,225,000 tons of the ore. Pyrite deposits totaling 2.3 million tons are also indicated, and a 7,100-square-mile area near Salima and along the eastern shore of Lake Malawi shows beach sands with mineral content of ilmenite, rutile, monazite, and zircon.

In Ghana, prospecting has resulted in a find of an estimated 88-million-ton reserve of bauxite ore at Kibi in the eastern region, and a 150-million-ton deposit of the ore has been located at Nyinahin in the Ashanti region. The possibility of exploitation of offshore oil near Saltpond is being investigated to determine if the quantity is commercially viable. Zambia is also proceeding with exploration of copper, uranium, and diamonds. Romania, with its oil exploration and evaluation capabilities, has been approached by both Zambia and Nigeria to aid in the search for oil. Nigeria is particularly anxious to assume its former position as the second largest producer in Africa and the tenth largest in the world by exploiting reserves located during the course of civil strife, but which then could not be developed. Additional exploration is believed necessary, for the problem in Nigeria, as in Romania and the U.S.S.R., is finding additional reserves of oil and gas to maintain continued efficient use of refinery capacity. In particular, the U.S.S.R. is faced with a declining discovery rate of new oil reserves to match production rates.

The interest in maintaining data on reserves of minerals due to fluctuations in demand for the various commodities, combined with pressure from environmental and pollution control groups has necessitated a reexamination of the resource base. Though generally always originating and maintaining itself in a limited geographic area, legal restraints, and output-consumption factors may affect the use or neglect of a commodity worldwide. Such is the case with sulfur and metal scrap. Particularly in the United States, concern for increases in sulfur and lead pollutants may result in more extensive elimination of those two elements during product refining and consumption. Fulfillment of regulations limiting sulfur and lead content in exhaust emissions coupled with retrieval of lead from storage batteries and other sources, will increase the available quantities of these two commodities. The stockpile resulting from the purification will probably, in the case of sulfur, greatly reduce or eliminate the need for any imports or production of sulfur-bearing ores except in specific areas, as in the case of the Territory of South-West Africa. In this instance, the Territory of South-West Africa sulfur requirements are still firm, and recent exploitation of a sulfur find is to be used to offset imports from Spain.

Of even greater significance is the use of metal scrap, particularly iron and steel scrap and also including aluminum, copper, zinc, cadmium, and titanium chip. The available quantities of these varies as with other commodities, but as alluded to previously, their stature is becoming less a nonusable material and more a reserve. Though no figures are available in regard to world reserves of iron and steel scrap, 200 million tons of the metal were consumed in 1965, compared with 90 million tons in 1950. Consumption in 1970 amounted to about 265 million tons. With the growing use of Linz-Donawitz furnaces and similar converters and improved methods and demand for scrap collecting, preparation, and transport, the position of scrap in terms of a valuable reserve is gaining importance. If development of electric furnaces continues to grow, the need for scrap can be expected to increase correspondingly.

INVESTMENT

Comprehensive data on worldwide investment in the mineral industry are not available; partial data on investment in selected geographic areas and within a few major commodity sectors of the total industry are outlined in this section and in the related tables. The most notable geographic omission is that of the centrally planned economy nations—the U.S.S.R., other East European countries, and the People's Republic of China. Also notable is the exclusion of investment by West European nations and Japan in the commodity sector of nonferrous metals. Although available data are inadequate as a base for extrapolation to estimate worldwide investment, they at least are illustrative of the continued expansion of the industry as a whole and reflect, at least for the non-Communist nations, the general rate of growth.

Table 15 summarizes steel industry investment expenditures for countries and country groups within the Organization for Economic Cooperation and Development (OECD). Unfortunately, data for 1971 were not available at this writing, thus nothing significant can be added to the comments provided in the previous edition of this chapter. Briefly summarizing these comments, 1970 investment expenditures at $6,549 million were 24.9 percent greater than those of 1969; this very substantial increase was attributed to increased steel demand in late 1968 and 1969, the necessity for increasing productivity and product quality to maintain competitive position, and sharply rising construction-installation costs. Geographically, Japan's 1970 investment growth was numerically the greatest, followed by that of West Germany ($307 million in 1969, $627 million in 1970 out of the EEC total in table 15). Most nations covered in the table however registered gains, with the United States and the Netherlands (included in the EEC total) being the only countries registering declines.

Table 16 summarizes non-Communist world petroleum industry capital expenditures and exploration expenses for 1969–71, distributing the totals on a geographic basis, and table 17 provides the distribution of the same totals on the basis of the various sectors of the industry. In 1971, overall capital expenditures and exploration expenses were 8.1 percent higher than those of 1970, slightly lower on a percentage basis than the 8.7-percent increase recorded for 1970 over the 1969 level, but considerably ahead of the 2.7-percent increase between 1968 and 1969, and quantitatively $20 million greater than the 1969-70 increase.

The geographic distribution of investment in 1970 and 1971 was as follows in percent of the non-Communist world total:

Area	Percent of total	
	1970	1971
United States	41.4	34.3
Other Western Hemisphere	14.1	15.5
Western Europe	15.7	18.2
Africa	4.1	4.9
Near East	2.9	3.8
Far East	10.2	11.4
Unspecified	11.6	11.9
Total	100.0	100.0

The relative ranking of the listed areas remained unchanged, but their percentage shares varied sharply, particularly the decline in the share of total accounted for by the United States.

Reviewing the changing growth rates on a geographic basis, all areas except the United States registered higher investment levels in 1971 than in 1970, with the greatest percentage increases occurring in the cases of the Near East, up 42.3 percent; Africa, up 26.4 percent; Western Europe, up 25.7 percent; and the Far East up 20.5 percent. Lesser gains were recorded for the Western Hemisphere excluding the United States, up 18.8 percent, and the regionally undistributed investment in tanker construction, up 11.1 percent. By way of comparison, the growth rates for these areas between 1969 and 1970 were as follows: Near East, down 21.2 percent; Africa, down 2.2 percent; Western Europe, up 29 percent; Far East, up 35.4 percent; Western Hemisphere less United States, up 1.7 percent; and tanker construction, up 26.9 percent. Of all areas listed in the table, only the United States itself showed declines both between 1969 and 1970 and between 1970 and 1971, the former a modest 2.1-percent decline, the latter a 10.4-percent decline. This latter decline because of the significant size of the base from which it occurred was wholly responsible for the fact that the non-Communist world total growth rate was only 8.7 percent between 1970 and 1971—all other areas registered increases substantially larger than the world average.

It is possibly worthy of note that the growth rate in tanker construction investment fell off significantly in 1971, apparently as available haulage capacity in supertankers completed and under construction began to approach the level of demand for such vessels.

Reviewing expenditures of the non-Communist world petroleum industry by industrial sectors (table 17), expenditures for crude oil and natural gas production once again headed the list, accounting for 28.1 percent of the total, with capital expenditures for refining ranking second with 20.5 percent, followed by: marketing, 14.6 percent; marine facilities, 12.4 percent; chemical plants, 6.6 percent; exploration expenses, 6 percent; pipelines, 5.2 percent; and natural gasoline plants, 3 percent, with miscellaneous expenses accounting for the remainder. Although these percentages differed from those recorded for 1970, the differences were not sufficient to change the relative ranking of the various sectors.

Table 18 details U.S. direct investment in, and earnings and income from, mining, smelting and metal refining, and petroleum industry activities in foreign areas for 1971, with world totals for 1968, 1969, and 1970 provided for comparison. The overall growth rate of this investment in mining, smelting and metal refining was 8.9 percent between 1970 and 1971, exceeding both the 1968–69 growth rate of 4.4 percent and the 1969–70 growth rate of 8.7 percent, but falling short of the 11.5-percent increase registered between 1967 and 1968. In the case of petroleum investment, the 1971 level was 11.7 percent above that of 1970, compared with the 9.2-percent increase registered in 1970 with respect to the 1969 level, 5.3 percent indicated for 1969 with respect to 1968, and the 8.6-percent increase between 1967 and 1968.

On a regional basis, U.S. mining, smelting, and metal refining investment showed declines between 1970 and 1971 in Latin America and the Far East, but increases elsewhere more than compensated for these declines, and the total level increased. In the case of petroleum industry investment, declines were registered in the Near East (an almost insignificant drop) and in the Far East and Pacific, but increases in other geographic areas here also more than compensated and the total advanced.

TRANSPORTATION

MARINE TRANSPORT

Three major classes of ocean going vessels are engaged in the transport of mineral commodities: oil tankers, bulk carriers, and freighters. Table 19, derived from a U.S. Maritime Commission report, lists these three classes individually and summarizes the world's total merchant fleet in terms of number of vessels and tonnage. In the case of each of these major classes, not all of the vessels listed are involved wholly or even partly in transporting mineral commodities. Tankers, which are devoted mainly to trade in crude oil and refinery products, also move some chemicals and products such as molten sulfur and whale oil. Bulk carriers, heavily engaged in the movement of metal ores, cement, and fertilizers, also move substantial quantities of bulk agricultural products. Freighters are not primarily engaged in mineral commodity shipment but nonetheless move sizable quantities of metal ingots and semimanufactures as well as some ores and concentrates.

In 1971, total world shipping of tanker and dry cargo was 2,707 million metric tons, an increase of 3.8 percent over the previous years' total of 2,608 million metric tons. Loadings of tanker cargo increased 6.6 percent over the previous year, but dry cargo tonnage exceeded the 1970 total by only 0.3 percent. The major movement in tanker cargo was in crude oil. Table 20 indicates the trend in tanker and dry cargo loaded and unloaded in international ports over a 5-year period.

Regional patterns of tanker cargo movement for 1971 indicate that the oil producing countries of the Near East continued to have the largest effect on international shipping. In fiscal year 1971, 768 million metric tons of tanker cargo was loaded, a 16-percent increase of 106 million metric tons over 1970. The Near East oil producers have registered an average of 13 percent annual increase in tanker loadings since 1967. Significantly lower totals were reported by other oil producing nations with some, such as Venezuela and the United States indicating their first reversal in cargo loadings in several years. In contrast to this, in 1971 developed market economies showed a 6.1-percent increase in unloadings of tanker cargo, exceeding the 1970 total by 69 million metric tons. Western Europe, Canada, and the United States continued to show increases in this area. The Soviet Union and the Eastern European nations registered 12.5- and 31.2-percent increases in loadings and unloadings, respectively, for fiscal year 1971, but with substantially lower quantities than any other region. Table 21 lists the loading and unloading of tanker cargo by year and region on a tonnage basis; table 22 indicates similar movement for dry cargo tonnage.

Data on a worldwide basis as to the share of mineral commodity trade in total commodity movement in 1971 is unavailable. However, in fiscal 1971, 60 percent by weight of all goods transiting the Panama Canal were mineral commodities. On the basis of this figure, it may be inferred that mineral commodities' share of the total world movement of goods is even higher, because of the fact that the dimensions of the Canal's locks exclude the growing proportion of tankers and bulk carriers that are accounting for a larger percentage of mineral commodity movement.

The world merchant fleet[6] at yearend 1971 totaled 20,544 vessels with a gross tonnage of 230,302,000 tons and a deadweight tonnage of 361,739,000 tons, increases of 2.8, 8.9, and 10.6 percent, respectively, over 1970 totals. The percentage increases registered for the total merchant fleet during 1971, except for number of vessels, exceeded those recorded since 1967.

Although increases were recorded for all classes of vessels comprising the merchant fleet in all categories of measurement except deadweight tonnage, the percentage increases between the various ship classes were radically different. Tankers and bulk carriers, which have consistently recorded gains in both number of vessels and tonnage, continued to show growth. The number of freighters increased over five times the amount brought into service between 1969 and 1970. Other vessels (passenger-cargo, passenger-refrigerated cargo, and refrigerated freighters) remained nearly stable in number and gross tonnage, but declined slightly in deadweight tonnage. Distribution of the world merchant fleet by vessel type continued to shift in 1971, with tankers and bulk carriers accounting for an increased share in both numbers and tonnage.

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[6] Oceangoing steam and motor ships of 1,000 gross tons and over.

Tankers.—The world tanker fleet increased by almost 200 vessels in 1971, exceeding that for any of the previous 6 years. Most of the vessels were supertankers, reflecting the continued expansion of these vessels in the light of uncertainty in the reopening of the Suez Canal. The total tanker fleet between yearend 1970 and yearend 1971 increased by 4.7 percent in number of vessels, 11.4 percent in gross tonnage, and 13.1 percent in deadweight tonnage; comparable figures for the previous corresponding period were 3.9, 11.9, and 14.1 percent, respectively.

The average gross tonnage of tankers in service increased from 21,006 tons in 1970 to 22,366 tons in 1971; in terms of deadweight tonnage the increase was from 36,171 tons to 39,087 tons. By way of comparison, in 1966 the average gross tonnage was 16,343 tons, and the average deadweight tonnage was 25,768 tons. On a tonnage basis the growth recorded exceeded that registered for any of the previous 6 years, with the percentage increase slightly lower than that for 1970. The emphasis on larger tankers is particularly noticeable when examined by various size groups, especially when data on existing vessels are compared with those for planned new construction. Table 23, compiled from a source other than the U.S. Maritime Commission (and thus differing slightly in totals given by that source and appearing elsewhere in this section), indicates that the total world's tanker fleet amounted to over 175 million deadweight tons, with an additional 88.6 million tons in progress or on order at yearend. In 1971, vessels in service in the 205,000-to 285,000-million-ton class accounted for 42.5 million tons, while those of the same weight class in progress or on order totaled 65.2 million tons, 73.6 percent of the projected increase. Tankers over 205,000 tons accounted for 25.5 percent of the total fleet in operation in 1971, compared with 20.9 percent in 1970 and none in 1966. When and if additions underway or on order at yearend 1971 are completed, and discounting reductions in deadweight tonnage owing to losses, scrappings, and other deletions from the roster of vessels in service at yearend 1971, 67.4 percent of the tanker fleet will be in ships over 125,000 tons.

The changeover in the world tanker fleet continued at a slightly slower pace in 1971 than in 1970, and is reflected in the total tonnage of vessels by age groups. The following tabulation compares the 1971 distribution of total tonnage by age groups with that recorded for 1970:

Year of completion	Percent of total tonnage	
	1970	1971
Up to yearend 1945	3.8	3.1
1946–50	1.7	1.4
1951–55	9.2	9.5
1956–60	18.9	16.8
1961–65	22.7	20.1
1965–70	43.7	50.4

Source: British Petroleum Co. Ltd. BP Statistical Review of the World Oil Industry—1971. Bayard Press, London, 1971, p. 14.

The word tanker fleet at yearend 1971 in terms of the flag of registry ranked in order of national aggregate deadweight tonnage was as follows:

Country	Number of vessels	Deadweight tonnage (thousand tons)
Liberia	777	42,518
United Kingdom	451	24,065
Japan	388	19,299
Norway	373	19,158
Greece	233	8,565
United States	291	8,050
France	134	7,448
Panama	183	5,848
U.S.S.R	419	5,301
Italy	207	5,119
Germany, West	69	3,457
Netherlands	93	3,396
Sweden	77	3,135
Denmark	60	2,959
Spain	106	2,708
Other	570	12,170
Total	4,431	173,196

Bulk Carriers.—The world bulk carriers fleet increased by 264 vessels in 1971, an 8.9-percent rate of increase, compared with 7.5 percent for 1970. The growth rate for bulk carriers in gross tonnage and deadweight tonnage exceeded that of any other vessel class, registering gains of 16.5 and 17.9 percent, respectively, compared with the 1970 rate of increase of 13.1 and 14.1 percent for the same tonnage categories.

As previously noted, this class of vessels includes both those hauling crude minerals and concentrates and those hauling bulk agricultural products. However, the increased growth is attributed chiefly to additions of large ore carriers and of large combination (ore-oil-other material) carriers. Although Maritime Commission data do not distinguish mineral commodity oriented bulk carriers from those engaged in agricultural trade, other sources indicate that at yearend 1971, 21.5 million deadweight tons of combined carriers were in building progress or on order. No information is presently available as to the total number of combination carriers presently in service; however, 20.3 million tons of these vessels were in the building stage or on order by yearend 1970, and it is reasonable to assume that a substantial number of these vessels were active by yearend 1971.

The average size of bulk carriers has shown a marked increase. By yearend 1971, the average gross tonnage of bulk carriers was 17,014 tons, compared with 15,978 tons in 1970 and 10,967 tons in 1966. Comparable figures for deadweight tonnage in the same time periods are 28,267, 26,125, and 16,762 tons, respectively.

The total number of bulk carriers in service, as well as the total of the aggregate deadweight tonnage of such vessels under the major flags of registry for 1971 are indicated in the following tabulation:

Country	Number of vessels	Deadweight tonnage (thousand tons)
Liberia	662	23,123
Japan	481	15,958
Norway	364	13,625
United Kingdom	306	7,744
Greece	228	5,005
Italy	131	3,783
Germany, West	87	3,271
Sweden	82	2,852
France	64	1,576
India	43	1,508
Panama	80	1,206
Spain	36	852
U.S.S.R	132	852
Denmark	27	769
United States	34	724
Other	461	8,114
Total	3,218	90,962

Freighters.—By yearend 1971, freighters accounted for 54 percent of the total number of vessels of the world's merchant fleet, 28 percent of the aggregate gross tonnage, and 24 percent of the aggregate deadweight tonnage. Compared with tankers and bulk carriers, a much smaller proportion of the total number of these vessels is engaged in moving mineral commodities; nonetheless mention of this class of ship is in order since they are the prime class of ocean carrier for processed mineral goods, particularly metal smelter and mill products. Although the number of new freighters put in service at yearend 1971 was considerably higher than the previous year, the growth is still far less than that of tankers and bulk carriers. Aggregate gross tonnage increased by 879,000 tons, compared with 199,000 tons for the previous year. Deadweight tonnage amounted to an additional 877,000 tons, over four times greater than the increase registered for 1970.

Freighters again showed a modest increase in tonnage size, from an average of 5,742 gross tons, and 7,949 deadweight tons in 1970 to 5,772 gross tons and 7,959 deadweight tons in 1971.

The following tabulation lists the principal nations of registry of freighters in order of their share in the aggregate deadweight tonnage of the total world freighter fleet at yearend 1971:

Country	Number of vessels	Deadweight tonnage (thousand tons)
United States	857	9,656
Japan	1,193	9,314
U.S.S.R	1,204	7,557
Greece	848	7,447
United Kingdom	773	7,010
Germany, West	731	5,396
Liberia	517	5,184
Norway	405	3,213
Panama	423	2,604
Netherlands	299	2,546
India	180	1,821
Other	3,665	26,557
Total	11,095	88,305

PANAMA AND SUEZ CANALS

In 1971 the Panama Canal again registered a record level of commodity transit. However, of the grand total of 120,534,000 tons of cargo passing through the canal in vessels classified as commercial ocean traffic, 73,355,000 tons consisted of mineral commodities. This represents a decrease of .3

percent from the previous year's total of mineral commodity tonnage, although mineral commodities as a group still accounted for the greatest proportion, 60.9 percent, of total commodity tonnage. The lower number of transits through the Panama Canal in 1971, down 175 from the previous year, is attributed mainly to the reduced number of U.S. Government transits, which returned to its approximate pre-Vietnam level. Mineral commodity movement and its importance in Panama Canal activity is summarized in the following tabulation:

	Fiscal years		
	1969	1970	1971
Number of transits:			
Commercial ocean traffic	13,150	13,658	14,020
Other traffic	2,177	1,865	1,328
Total	15,327	15,523	15,348
Cargo moved (million metric tons):			
Commercial ocean traffic:			
Mineral commodities	63.9	72.5	72.2
Other commodities	39.1	43.6	48.3
Subtotal	103.0	116.1	120.5
Other traffic, all commodities	7.5	4.7	2.4
Total	110.5	120.8	122.9

A breakdown of commercial ocean traffic through the canal for the years 1970 and 1971, in terms of vessel type, cargo tonnage, number of transits, direction of movement (Atlantic to Pacific, Pacific to Atlantic), and by status of the vessel (in ballast or laden) is given in table 24. A further detailed tabulation of specific mineral commodities and commodity groups by direction of movement over a 3-year period is listed in table 25.

The movement of mineral commodities from Atlantic to Pacific accounted for 71.5 percent of total Panama Canal traffic, down 1,322,000 tons from 1971. The reduction in tonnage from Atlantic to the Pacific was nearly compensated for by increased shipments from the Pacific to the Atlantic, up 1,008,000 tons, with coal and coke, steel semimanufactures, and bauxite showing the greatest gains. However, steel semimanufactures, still the dominant commodity group, continued to account for the greatest proportion of Atlantic bound tonnage; 31.5 percent in 1971, compared with 31.9 percent in 1970. As in the past coal and coke and petroleum (crude and refined) were the dominant commodities in transit destined for the Pacific; in 1971, coal and coke together accounted for 42.9 percent of the total, and petroleum, for 27.5 percent.

With little prospect for settlement of disagreements in the Arab Republic of Egypt and Israel conflict, the Suez Canal continued to have a negative influence on marine mineral transport patterns, as the Canal remained closed for the fourth full year. Dependence on the Suez Canal for the movement of much needed crude oil, if and when it reopens, appears to be decreasing with the threat of continued hostilities in the region and the change to supertankers. Persian Gulf oil deliveries to European markets continued to increase and except for shipments moving overland by pipeline from the producing areas to Eastern Mediterranean ports, which are limited by pipeline capacity, the entirety of such oil shipments were forced into the Cape of Good Hope shipping route.

OCEAN FREIGHT RATES

Ocean freight rates for 1971 dropped sharply below those posted for 1970 for selected countries due in part to the reopening of Trans-Arabian Pipeline. United Nations indexes were revised to allow for more complete coverage of selected rates chosen for publication, thus data are not available for all rates used in previous editions of this chapter. However, available data indicate that the downward trend finally broken by abruptly higher 1970 rates may have stabilized to more realistic levels. United Nations indexes of selected ocean freight rates for 1968–71, including quarterly figures for 1970 and 1971, are presented in table 26.

PIPELINES

Because of the general unavailability of complete worldwide summaries of existing pipeline systems, detailed reporting of pipeline development on a worldwide basis is limited. However, mention of several major projects of international significance during 1971 is made in the following section.

In both western and eastern Europe, as in other areas of the world, most major developments appeared tied to deliberations presently under survey or planned for the future. However, it was clear that existing crude oil pipelines in western and eastern Europe were inadequate, and plans were being formulated to construct additional lines incorporating larger diameter pipe parallel to existing pipelines. Two such projects, accounting for a total of 486 miles of pipeline, consisted of construction of a 26-inch crude oil line from Fos to Lyon, and a 40-inch line from Fos to Karlsruhe. Smaller pipelines for crude oil were also planned in Yugoslavia and Spain. In eastern Europe, the Druzhba system, extending 2,796 miles and linking pipelines from as far as Western Siberia, will be the route for the new Druzhba II line. The new pipeline, presently under construction, will be made up of pipe up to 47 inches in diameter, larger than any in western Europe. As part of the system, a new products line is planned from Berlin to Dresden.

Technical and economic studies begun in 1970 involving the construction of a sub-Mediterranean gas pipeline to Sicily and southern Italy continued into 1971 in the advanced stage of development. Algeria initiated studies for a gas pipeline from Hassi R' Mel across Morocco and the Straits of Gilbraltar; France continued its construction of a 24-inch main trunk line to carry new Algerian gas supplies from the Fos terminal 133 miles to Tersanne.

In the Near East, the Suez Canal remained closed, with the Arab Republic of Egypt proposing reopening in at least 5 months for vessels with up to 38 feet of drought if Israel would withdraw its forces. However, agreement had still not been reached by yearend 1971, and other means of oil movement were sought. The Arab Republic of Egypt planned the Sumed line, a 205-mile, 42-inch diameter crude oil pipeline from Ain Soukhna on the Gulf of Suez to a point near Alexandria, passing south of Cairo.

The traditional Suez Canal bypass pipeline, the Trans-Arabian Pipeline (TAPline), closed since May 3, 1970, following rupture of the line by a bulldozer, was repaired within 24 hours in January 1971, when the Governments involved finally reached agreement. The pipeline is capable of moving 480,000 barrels per day to the Mediterranean.

The Japanese continued to maintain active interest in Russian crude oil and natural gas pipeline development. With enormous potential existing for crude oil production in the Tyumen and River Ob areas, the U.S.S.R. presently has two major pipeline projects in progress. One is planned to connect West Siberia with industrial areas in the west, and is to extend 2,858 miles. The crude oil pipeline, which is to extend 3,728 miles from Omsk and Surgut to Nokhodka, is presently as far as Irkutsk, its ultimate purpose being to supplement Soviet Far East industry as well as provide possible sales of oil to Japan. A possible completion date has been scheduled for some time in 1975. Japan, well aware that its future petroleum needs will be heavily dependent on imports, is giving careful attention to updating its existing facilities and coordinating plans to move oil, which will be fed by giant tanker to nine ocean terminals, inland along an estimated 500 miles of pipeline. Plans to facilitate transport between industrial areas have also been put forth, one calling for 134 miles of product line (gasoline, kerosine, and gas oil) from Tokyo bay to Takasaki and Utasnomiya.

In the Western Hemisphere, Alaska's north slope continued to be the main area of interest for pipeline development. The last lengths of pipe needed for construction of the proposed line extending 800 miles from Prudhoe Bay to Valdez were delivered, but work was held up pending settlement of injunctions by ecological and conservation interests. A number of other proposals for extensive pipeline development have been offered. Study on a 1,700-mile crude oil line from Prudhoe Bay to Edmonton, where additional relay and pumping facilities already exist, is in progress. U.S. and Canadian interests are also studying the possibility of building a 1,550-mile gas pipeline from the North slope to Alberta, and at the same time an independent study is underway for construction of 2,000 miles of gas pipeline from Prudhoe Bay through British Columbia to Kingsgate on the U.S. border.

In view of the present situation on the north slope of Alaska, as well as Canada's own petroleum production, that country is devoting extensive efforts to expansion of existing pipelines to bring Canadian oil and natural gas to growing U.S.. markets. Canadian interests have applied for approval to add 700 miles of new pipe to the transcontinental system in 1971 and 1972; plans have been made to begin a test gas pipeline at Sans Sault Rapids on the Mackenzie River to extend 2,500 miles to the U.S. midwest.

In Bolivia, work resumed on the 330-mile natural gas pipeline from the Santa Cruz gas fields to Yacuiba near the Argentine border. Completion of the project, which ceased in 1968 following nationalization of the gas fields, will make Bolivia the first major exporter of South American gas.

PRICES

In 1971, mineral commodities as a group registered higher average prices than in the preceding year. As could be expected, considerable variation of average prices among major mineral commodities within the group took place as world markets adjusted themselves to demand for individual commodities. Total world steel production decreased by approximately 2 percent from 1970, and steel prices worldwide showed a general price advance in most countries. In the United States, steel prices averaged upward for the year until mandatory price freezes were instituted by the Government at the end of the third quarter. The increase in the average price of steel for the overall steel industry worldwide was attributed in part to the cost of implementation of pollution control devices and monitoring systems and to currency adjustments.

Examination of average annual prices for several major metals indicates, at least in some cases, a severe reversal over 1970 average prices. Tables 27, 28, and 29, record the average price of major nonferrous metals in the United States, Canada, and the United Kingdom for a 3-year period, with monthly averages given for 1971. Analysis indicates that primarily in the case of zinc was there an increase in the average price of the metal for the year. Monthly averages reveal consecutively higher rates throughout the year, except in the case of the United Kingdom, where declines were registered in February, April, and September. A high of 17.000 cents (Canadian and American) per pound was reached in August in Canada and the United States, and an average of £141.97 per long ton was reached in December in the United Kingdom. Aluminum was the only other major nonferrous metal registering an increase; the average annual price increased slightly in the United States and the United Kingdom, but remained stable in Canada.

Copper prices continued to drop in 1971, usually lower on a monthly basis throughout the year in comparison with 1970 figures, with the United States and Canadian averages generally following identical trends. All three markets showed a decline in the average price of copper; in the case of the United Kingdom, the 1971 decline was considerably greater than that in 1970, £143.47 per long ton as opposed to £33.25 per long ton in 1970. Growing surplus and location of additional reserves seem to be the primary cause for the decline.

Lead and tin prices in the United Kingdom averaged lower in 1971 than in 1970 and 1969. The same held true for average lead prices in Canada and the United States. The Canadian price of 13.500 cents per pound held firm throughout 1971, but U.S. lead prices edged upward in June, following a 13.300-cent-per-pound average for each of the first 5 months.

The average price per ounce of silver dropped drastically for all three countries, continuing the trend of declining prices since 1968. The U.S. price for silver dropped below the 154.968 cents per troy ounce registered in 1967, as did the Canadian average annual price. On the Canadian and U.S. markets fluctuation in prices was erratic for the first quarter. The second quarter began with a strong increase but the rise could not be maintained and prices dropped from May to yearend, when another strong gain was registered at the end of the last quarter.

Export price indexes for mineral commodities and an analysis of export price indexes as determined by the United Nations are given in tables 30 and 31, respectively. The mineral commodity export price indexes table indicates a strong trend in the rise of overall crude mineral prices for 1971. This represents a considerable reversal of the decline in price indexes that took place between 1964 and 1968. The annual average price index for all crude minerals for 1971 was 127 (1963=100), 18 index points above the 1970 index of 109. The major portion of the growth spurt took place in the first half of 1971. Metal ores registered a price index of 126 for 1971, compared with 122 for 1970. However, the fuels export price index showed enormous growth compared with the previous 4 years annual average of approximately 100. Again, the first quarter of 1971 showed a growth of 15 index points over the average for 1970, with the second quarter increasing by another 8 index points. At yearend the annual average stood at 127.

In the tabulation of the analysis of export price indexes, it is interesting to note that the annual average for nonferrous base metals declined considerably from the 1970 figures for both developed and developing areas, paralleling the general decline noted previously for the prices of major nonferrous metals in the United States, Canada, and the United Kingdom. In the nonferrous base metals, the developing areas still maintained an edge over developed areas in terms of average annual price index, but by a much smaller margin than that of 1970. The export price index reveals that the second quarter of 1971 was the period of highest prices for the nonferrous base metals for that year. However, in spite of the decline in the base metal price index, export price indexes for total minerals for both developed and developing areas reached new highs for the year. Again, the largest increase occurred in the first two quarters of the year, closing the year at an index of 145 for developed areas and 119 for developing areas, 23 and 15 index points above 1970 levels, respectively.

World average prices and indexes for other individual mineral commodities are not readily available in comparable form with those listed previously in this section. Nonetheless, considering the increasing demand for crude oil and petroleum refinery products (which account for the greatest portion of total world mineral product value), as well as transportation factors resulting from the closing of the Suez Canal, it is reasonable to assume that prices of those commodities advanced again in 1971.

STATISTICAL SUMMARY OF WORLD PRODUCTION AND TRADE OF MAJOR COMMODITIES

The final 30 tables in this chapter (tables 32 to 61) extend the statistical series that was started in the 1963 edition of the International Area Reports volume of the Minerals Yearbook and that was subsequently updated in the 1965, 1967, 1968, 1969 and 1970 editions. They are provided both as a supplement to other statistical data within this chapter and as a summary of international production and trade data for major commodities covered in greater detail on a commodity basis in volume I of the 1971 Minerals Yearbook and on a country basis in volume III.

The data presented here on production (tables 32 to 50) in most instances represent the most accurate figure available at the time of compilation of this chapter, which was subsequent to the completion of all commodity and country chapters. Because of this, they may differ from data presented in this volume in the country chapters (where a more reliable figure became available after the country chapter was completed) and/or from the metric unit equivalent of data presented in volume I (where a more reliable figure became available subsequent to the completion of the commodity chapter).

The data on world trade in major mineral commodities presented in this chapter (tables 51 to 61) may not correspond exactly to those presented elsewhere in the Minerals Yearbook because these summary tables are compiled from sources other than those used in the individual country chapters in order to obtain data on a consistent basis. The differences, however, are regarded as unimportant from the viewpoint of displaying the general pattern of trade in these commodities.

Table 1.—United Nations indexes of world[1] mineral industry production

(1963=100)

Industry sector and geographic area	1969	1970	1971	1971, by quarters			
				1st	2nd	3rd	4th
EXTRACTIVE INDUSTRIES							
Metals:							
Non-Communist world	125	132	129	124	133	130	130
Industrialized countries [2]	121	131	131	126	137	130	132
United States and Canada	119	133	129	123	140	124	126
Europe	119	122	125	123	133	117	129
European Economic Community [3]	93	90	86	91	89	79	87
European Free Trade Association [4]	134	135	140	144	153	119	146
Australia and New Zealand	168	188	201	182	190	220	212
Less industrialized countries [5]	133	136	126	121	125	130	129
Latin America [6]	135	139	136	128	132	143	140
Asia [7]	125	139	147	139	147	149	153
Communist Europe [8]	172	187	200	202	198	200	197
World	139	145	145	141	147	146	145
Coal:							
Non-Communist world	91	90	88	95	92	84	80
Industrialized countries [2]	89	88	85	93	90	82	77
United States and Canada	117	124	117	134	133	123	80
Europe	77	74	73	78	73	67	72
European Economic Community [3]	79	77	75	81	74	70	77
European Free Trade Association [4]	71	66	65	71	70	57	62
Australia and New Zealand	172	184	181	160	195	161	208
Less industrialized countries [5]	121	123	121	120	121	118	124
Latin America [6]	136	141	139	NA	NA	NA	NA
Asia [7]	121	121	119	119	119	118	122
Communist Europe [8]	118	124	128	128	126	125	133
World	102	104	105	109	106	102	102
Crude petroleum and natural gas:							
Non-Communist world	152	165	170	172	171	168	172
Industrialized countries [2]	127	134	136	140	134	134	138
United States and Canada	125	130	130	133	129	129	130
Europe	154	179	200	214	188	176	220
European Economic Community [3]	152	170	182	196	172	165	197
European Free Trade Association [4]	146	207	265	298	240	199	322
Australia and New Zealand	NA	NA	NA	NA	NA	NA	NA
Less industrialized countries [5]	177	197	205	204	207	202	207
Latin America [6]	118	121	118	122	120	114	115
Asia [7]	174	192	216	206	220	218	223
Communist Europe [8]	163	175	187	192	190	184	182
World	155	167	174	176	175	171	175
Total extractive industry:							
Non-Communist world	132	140	141	142	143	139	141
Industrialized countries [2]	116	121	121	123	124	119	120
United States and Canada	123	128	126	129	130	126	122
Europe	102	105	108	110	108	101	111
European Economic Community [3]	108	112	114	118	112	108	121
European Free Trade Association [4]	88	87	89	93	94	79	89
Australia and New Zealand	167	190	207	183	204	213	228
Less industrialized countries [5]	164	179	183	181	184	181	184
Latin America [6]	123	126	123	124	124	122	122
Asia [7]	166	183	203	194	206	204	209
Communist Europe [8]	144	155	165	166	166	163	164
World	136	144	149	149	151	147	148
PROCESSING INDUSTRIES							
Base metals:							
Non-Communist world	148	149	144	150	154	133	140
Industrialized countries [2]	148	148	142	149	153	130	137
United States and Canada	135	127	120	131	137	102	110
Europe	141	145	140	145	145	131	140
European Economic Community [3]	147	151	144	150	148	136	143
European Free Trade Association [4]	123	125	120	125	126	108	120
Australia and New Zealand	143	150	150	147	147	158	149
Less industrialized countries [5]	154	160	175	158	179	184	179
Latin America [6]	158	169	188	161	195	201	197
Asia [7]	152	150	161	161	160	163	158
Communist Europe [8]	154	164	174	176	173	173	173
World	150	154	153	158	160	145	150
Nonmetallic mineral products:							
Non-Communist world	138	141	147	132	153	152	151
Industrialized countries [2]	136	137	142	128	149	147	146
United States and Canada	124	118	122	111	128	126	124
Europe	139	146	152	132	161	157	157
European Economic Community [3]	134	141	145	120	154	153	151
European Free Trade Association [4]	136	139	145	137	153	143	146
Australia and New Zealand	148	152	154	139	158	159	158

See footnotes at end of table.

Table 1.—United Nations indexes of world [1] mineral industry production—Continued

(1963 = 100)

Industry sector and geographic area	1969	1970	1971	1971, by quarters 1st	2nd	3rd	4th
PROCESSING INDUSTRIES—Continued							
Nonmetallic mineral products—Continued							
Non-Communist world—Continued							
Less industrialized countries [5]	158	174	188	169	190	197	195
Latin America [6]	152	170	187	171	183	194	201
Asia [7]	176	195	202	189	204	208	206
Communist Europe [8]	163	179	195	192	199	191	198
World	147	155	165	155	171	167	169
Chemicals, petroleum and coal products:							
Non-Communist world	175	183	194	187	194	192	201
Industrialized countries [2]	177	184	194	188	195	192	201
United States and Canada	170	171	179	170	180	182	185
Europe	179	193	203	202	205	194	211
European Economic Community [3]	185	200	211	209	212	202	220
European Free Trade Association [4]	161	172	178	179	182	168	182
Australia and New Zealand	160	172	194	170	199	206	200
Less industrialized countries [5]	158	174	188	179	183	192	198
Latin America [6]	161	180	195	NA	NA	NA	NA
Asia [7]	155	167	181	175	175	183	192
Communist Europe [8]	192	213	236	233	238	238	234
World	178	189	202	197	203	202	207
OVERALL INDUSTRIAL PRODUCTION							
Non-Communist world	148	152	156	155	156	152	160
Industrialized countries [2]	147	150	153	152	154	149	158
United States and Canada	144	140	141	140	141	140	142
Europe	140	148	152	152	153	142	160
European Economic Community [3]	142	151	155	156	156	145	164
European Free Trade Association [4]	131	136	138	139	140	127	145
Australia and New Zealand	147	155	163	154	164	170	164
Less industrialized countries [5]	155	166	177	171	177	177	181
Latin America [6]	148	158	169	NA	NA	NA	NA
Asia [7]	155	166	180	176	179	181	185
Communist Europe [8]	163	177	192	193	193	189	192
World	152	159	166	165	167	163	169

NA Not available.

[1] Excludes a number of countries of the Near East and Africa as well as People's Republic of China, North Korea, and North Vietnam.

[2] All countries having a per capita value added in manufacturing in 1958 equivalent to US$125 or more.

[3] Belgium, France, West Germany, Italy, Luxembourg, and the Netherlands.

[4] Austria, Denmark, Norway, Portugal, Sweden, Switzerland, and the United Kingdom.

[5] Countries having a per capita value added in manufacturing in 1958 or less than US$125.

[6] Central and South America and the Caribbean Islands.

[7] Afghanistan, Brunei, Burma, Ceylon, Hong Kong, India, Indonesia, Iran, Republic of Korea, Malaysia (excluding Sabah), Mongolia, Pakistan, Philippines, Singapore, Taiwan, Thailand, and South Vietnam.

[8] Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Romania, and U.S.S.R.

Source: United Nations. Monthly Bulletin of Statistics. August 1972, pp. x–xxiii.

Table 2.—World production [1] of major mineral commodities

Commodity	1969	1970	1971 p
METALS			
Aluminum:			
Bauxite ... thousand metric tons	51,972	56,883	62,467
Alumina ... do	19,184	20,737	22,371
Unalloyed ingot metal ... do	8,966	9,661	10,269
Antimony ... do	67	70	66
Arsenic, white [2] ... do	50	53	54
Beryl ... metric tons	6,736	6,237	5,335
Bismuth [2] ... do	3,750	3,799	3,829
Cadmium ... do	17,592	16,628	15,442
Chromite ... thousand metric tons	5,290	6,001	6,298
Cobalt:			
Mine [2] ... metric tons	19,789	23,899	23,309
Refined [2] ... do	17,731	21,270	22,510
Columbium-tantalum concentrates [2 3] ... do	14,154	20,427	12,753
Copper:			
Mine ... thousand metric tons	5,616	6,023	6,049
Smelter ... do	5,819	6,096	6,117
Gold ... thousand troy ounces	50,598	47,525	46,517
Iron and steel:			
Iron ore ... thousand metric tons	712,585	767,862	778,780
Pig iron [4] ... do	401,097	430,973	429,924
Ferroalloys [4] ... do	9,157	9,489	9,794
Crude steel ... do	573,390	594,478	580,939
Lead:			
Mine ... do	3,250	3,414	3,413
Smelter ... do	3,218	3,310	3,213
Magnesium ... do	200	222	234
Manganese ore ... do	17,124	18,204	21,002
Mercury ... thousand 76-pound flasks	289	284	315
Molybdenum ... metric tons	72,288	80,739	77,593
Nickel ... thousand metric tons	485	632	642
Platinum-group metals ... thousand troy ounces	3,432	4,239	4,075
Selenium [5] ... metric tons	1,400	1,381	1,138
Silver ... thousand troy ounces	296,094	305,369	294,184
Tellurium [2] ... metric tons	179	167	154
Tin:			
Mine [2] ... thousand long tons	226	229	232
Smelter ... do	226	221	228
Titanium concentrates:			
Ilmenite [3] ... thousand metric tons	3,204	3,584	3,346
Rutile [2 3] ... do	396	420	378
Tungsten, mine output, metal content ... metric tons	32,337	33,852	36,760
Uranium oxide (U_3O_8) [3] ... do	19,358	20,066	20,832
Vanadium [3] ... do	16,913	18,682	19,173
Zinc:			
Mine ... thousand metric tons	5,344	5,476	5,565
Smelter ... do	4,974	4,891	4,740
NONMETALS			
Asbestos ... do	3,297	3,488	3,577
Barite ... do	3,979	4,029	3,848
Cement, hydraulic ... do	542,614	571,596	605,475
Diamond:			
Gem ... thousand carats	13,064	13,348	12,670
Industrial ... do	27,108	29,307	29,605
Diatomite ... thousand metric tons	1,404	1,381	1,327
Feldspar ... do	2,456	2,476	2,426
Fluorspar ... do	3,884	4,154	4,624
Graphite [1] ... do	376	386	384
Gypsum ... do	52,646	52,574	54,056
Magnesite [2] ... do	12,724	14,281	14,688
Mica ... do	214	209	215
Nitrogen fertilizers, contained nitrogen [6] ... do	28,693	30,546	32,870
Phosphate rock ... do	80,505	84,392	86,043
Potash (marketable), K_2O equivalent ... do	17,163	18,152	19,724
Pumice [3] ... do	14,650	15,052	16,005
Pyrites, including cupreous, gross weight ... do	21,035	22,391	21,541
Salt ... do	137,187	145,579	142,843
Strontium minerals [3] ... metric tons	47,108	59,316	124,727
Sulfur, elemental ... thousand metric tons	20,605	21,893	21,637
Talc, soapstone, and pyrophyllite ... do	4,694	4,872	4,899
Vermiculite [3] ... do	452	417	443

See footnotes at end of table.

Table 2.—World production [1] of major mineral commodities—Continued

Commodity	1969	1970	1971 [p]
MINERAL FUELS AND RELATED MATERIALS			
Coal: [7]			
Anthracite million metric tons	180	180	180
Bituminous do	1,940	2,013	2,009
Lignite do	761	788	799
Total do	[8] 2,880	2,981	[8] 2,989
Coke:			
Metallurgical thousand metric tons	335,401	349,655	341,157
Other types do	27,847	25,070	21,726
Fuel briquets do	140,191	125,549	91,136
Gas, natural, marketed billion cubic feet	33,990	37,566	39,943
Peat thousand metric tons	184	186	184
Petroleum, crude million barrels	15,215	16,689	17,648

[p] Preliminary.

[1] Incorporates numerous revisions from world production tables and country production tables appearing in Volumes I and III, respectively, of the Minerals Yearbook as well as in the corresponding table in previous editions of this chapter.

[2] U.S. production data withheld to avoid disclosing individual company confidential data.

[3] Excludes production from Communist countries: Albania, Bulgaria, People's Republic of China, Cuba, Czechoslovakia, East Germany, Hungary, Mongolia, North Korea, North Vietnam, Poland, Romania, U.S.S.R., and Yugoslavia, except in the case of vanadium which includes a figure for the U.S.S.R. alone.

[4] Data presented for pig iron includes relatively small quantities of ferroalloys (not duplicating quantities reported under ferroalloys) produced in a few countries that do not report ferroalloy production separate from pig iron production.

[5] Excludes production from countries listed in footnote 3 except for Yugoslavia.

[6] Years ending June 30 of that stated.

[7] Production of coal by some countries is not reported divided into the three categories listed; such output has been distributed to the three listed grades according to best available information from supplementary sources relating to the quality of such coals.

[8] Detail does not add to total because of independent rounding.

Table 3.—Approximate percentage distribution of world mineral commodity production by major area in 1971 [1]

Commodity	Western Hemisphere			Eastern Hemisphere							World	
				Europe			Near East and Asia					
	North and Central America [2]	South America	Total	Non-Communist [3]	Communist [4]	Africa	Non-Communist	Communist [5]	Oceania	Total	Non-Communist[3]	Communist [2]
METALS												
Aluminum:												
Bauxite	26.7	16.0	42.7	13.5	11.0	5.7	6.1	0.9	20.1	57.3	88.1	11.9
Alumina	42.4	6.7	49.1	13.3	12.5	3.0	9.0	1.2	11.9	50.9	86.3	13.7
Aluminum ingot	44.9	1.6	46.5	22.2	15.3	1.6	10.9	1.3	2.2	53.5	83.4	16.6
Antimony, mine output	10.2	19.2	29.4	6.9	11.4	24.4	8.2	18.0	1.7	70.6	70.6	29.4
Arsenic, white [6]	[6] 21.3	1.5	22.8	55.3	13.3	6.8	1.8	([7])	--	77.2	86.7	13.3
Beryllium, beryl concentrate [6]	([6])	52.5	52.5	.3	24.4	21.5	--	([7])	1.3	47.5	75.6	24.4
Bismuth, mine output [6]	[6] 18.1	42.9	61.0	5.4	3.5	NA	23.7	([7])	6.4	39.0	96.5	3.5
Cadmium, smelter output	28.9	1.1	30.0	24.0	20.6	3.1	17.3	1.4	3.6	70.0	78.0	22.0
Chromium, chromite	--	.4	.4	2.7	37.1	34.4	25.4	([7])	--	99.6	62.9	37.1
Cobalt:												
Mine [6]	[6] 16.4	--	16.4	4.7	6.9	70.6	--	([7])	1.4	83.6	86.4	13.6
Smelter	6.8	--	6.8	13.2	7.1	72.9	NA	([7])	--	93.2	92.9	7.1
Columbium-tantalum, concentrate [6]	35.5	50.5	86.0	.1	XX	12.8	.5	XX	.6	14.0	100.0	XX
Copper:												
Mine	34.9	15.6	50.5	3.9	13.2	21.4	6.2	1.9	2.9	49.5	84.8	15.2
Smelter	31.0	13.2	44.2	6.8	12.7	20.7	11.5	1.8	2.3	55.8	85.5	14.5
Gold, mine output	8.6	1.1	9.7	.6	14.5	70.6	2.4	.4	1.8	90.3	85.1	14.9
Iron and steel:												
Iron ore	16.7	10.7	27.4	16.7	27.6	7.8	5.1	7.3	8.1	72.6	65.1	34.9
Pig iron and ferroalloys	19.5	1.6	21.1	24.5	26.3	1.1	18.7	6.9	1.4	78.9	66.8	33.2
Crude steel	21.4	1.7	23.1	26.1	28.0	1.0	16.6	4.0	1.2	76.9	68.0	32.0
Lead:												
Mine	32.0	7.8	39.8	13.4	19.6	5.8	4.4	5.2	11.8	60.2	75.2	24.8
Smelter	28.3	4.3	32.6	19.7	21.5	3.9	7.1	5.1	10.1	67.4	73.4	26.6
Magnesium, smelter	50.5	--	50.5	22.9	22.1	--	4.1	.4	--	49.5	77.5	22.5
Manganese ore, gross weight	1.3	12.7	14.0	.3	35.7	29.7	10.4	4.8	5.1	86.0	59.5	40.5
Mercury, mine output	22.5	1.3	23.8	41.1	18.0	2.3	6.6	8.2	([9])	76.2	73.8	26.2
Molybdenum, mine output	79.7	9.2	88.9	.5	10.3	--	.3	NA	--	11.1	89.7	10.3
Nickel, mine output	49.3	.4	49.7	2.3	19.0	3.8	4.2	NA	21.0	50.3	75.4	24.6
Platinum-group metals, mine output	11.9	.6	12.5	([9])	56.4	30.7	.3	NA	.1	87.5	43.6	56.4
Selenium, smelter output [8]	59.4	.6	60.0	18.8	XX	--	20.9	XX	.3	40.0	100.0	XX
Silver, mine output	43.6	18.1	61.7	6.1	15.8	2.8	5.7	.5	7.4	38.3	83.7	16.3
Tellurium, smelter output [8]	61.3	15.6	76.9	--	XX	--	23.1	XX	--	23.1	100.0	XX
Tin:												
Mine [6]	[6] .4	14.1	14.5	1.2	12.5	8.1	50.9	8.6	4.2	85.5	78.9	21.1
Smelter [6]	[6] .2	4.5	4.7	14.9	12.8	4.3	51.8	8.8	2.7	95.3	78.4	21.6
Titanium concentrate:												
Ilmenite [8]	41.6	.3	41.9	24.1	XX	--	9.7	XX	24.3	58.1	100.0	XX
Rutile [8]	--	([9])	([9])	--	XX	1.4	1.5	XX	97.1	100.0	100.0	XX
Tungsten, mine output	14.6	12.4	27.0	5.3	19.0	1.0	15.8	27.6	4.3	73.0	53.4	46.6
Uran[illegible]ide (U_3O_8) [8]	56.2	.2	56.4	19.1	XX	23.1	--	XX	1.4	43.6	100.0	XX
Va[illegible]	24.9	3.1	28.0	11.8	16.6	43.6	--	NA	--	72.0	83.4	16.6

Zinc:												
Mine	36.2	8.8	45.0	13.0	17.7	4.7	7.3	4.2	8.1	55.0	78.1	21.9
Smelter	24.1	2.1	26.2	24.0	21.0	3.4	15.6	4.2	5.6	73.8	74.8	25.2
NONMETALS												
Asbestos	44.8	.6	45.4	4.1	32.3	12.1	1.6	4.5	(9)	54.6	63.2	36.8
Barite	29.9	8.1	38.0	30.4	13.2	3.2	7.8	6.7	.7	62.0	80.1	19.9
Cement, hydraulic	15.1	4.0	19.1	30.8	24.2	2.9	19.2	2.9	.9	80.9	72.7	27.3
Diamond:												
Gem	--	2.4	2.4	--	14.2	83.2	.2	(7)	--	97.6	85.8	14.2
Industrial	--	1.9	1.9	--	23.6	74.5	(9)	(7)	--	98.1	76.4	23.6
Diatomite	39.9	.8	40.7	30.3	27.9	.3	.2	(7)	.6	59.3	72.1	27.9
Feldspar	32.3	2.4	34.7	46.3	11.5	.7	6.6	(7)	.2	65.3	88.5	11.5
Fluorspar	32.4	1.6	34.0	28.4	12.8	6.1	10.9	7.8	--	66.0	79.4	20.6
Graphite [6]	[6]13.3	.7	14.0	11.3	20.8	5.5	21.1	27.3	--	86.0	51.9	48.1
Gypsum	32.1	2.3	34.4	39.7	12.1	2.2	9.0	1.0	1.6	65.6	86.9	13.1
Magnesite [6]	[6]19.0	1.8	20.8	21.7	34.1	.6	4.3	18.4	.1	79.2	47.5	52.5
Mica	59.3	1.5	60.8	2.6	17.7	4.1	14.8	(7)	--	39.2	82.3	17.7
Nitrogen fertilizers, contained nitrogen	29.2	.9	30.1	24.9	26.9	1.1	12.2	4.3	.5	69.9	68.8	31.2
Phosphate rock	41.2	.4	41.6	(9)	25.3	25.0	1.8	2.3	4.0	58.4	72.4	27.6
Potash, K_2O equivalent (marketable)	29.7	.1	29.8	29.1	36.7	1.3	3.1	(7)	--	70.2	63.3	36.7
Pumice [8]	20.0	1.1	21.1	78.9	XX	(9)	NA	XX	(9)	78.9	100.0	XX
Pyrite, including cupreous [6]	[6]1.3	--	1.3	36.5	27.3	5.9	16.2	11.6	1.2	98.7	61.1	38.9
Salt	35.6	2.8	38.4	24.6	14.5	1.4	7.9	11.0	2.2	61.6	74.5	25.5
Strontium minerals [8]	71.4	.4	71.8	27.9	XX	--	.3	XX	--	28.2	100.0	XX
Sulfur:												
Native	65.5	1.5	67.0	.3	30.9	--	.8	1.0	--	33.0	68.1	31.9
Byproduct, elemental	57.0	.1	57.1	25.6	7.0	.3	10.0	(7)	--	42.9	93.0	7.0
Talc, soapstone, and pyrophyllite	20.5	.9	21.4	15.7	9.0	.3	47.5	4.9	1.2	78.6	86.1	13.9
Vermiculite [8]	68.1	1.7	69.8	--	XX	30.1	.1	XX	--	30.2	100.0	XX
MINERAL FUELS AND RELATED MATERIALS												
Coal:												
Anthracite and bituminous	23.8	.3	24.1	14.5	31.0	2.9	5.8	19.4	2.3	75.9	49.6	50.4
Lignite	1.1	--	1.1	19.7	75.0	--	1.3	--	2.9	98.9	25.0	75.0
Coke:												
Metallurgical	17.1	.7	17.8	27.0	32.1	1.1	13.7	7.0	1.3	82.2	60.9	39.1
Other types	--	.9	.9	16.4	42.8	.6	38.4	(7)	.9	99.1	57.2	42.8
Fuel briquets	--	--	--	14.6	72.8	(9)	11.0	(7)	1.6	100.0	27.2	72.8
Gas, natural, marketed	63.9	1.9	65.8	8.9	22.0	.3	2.8	(7)	.2	34.2	78.0	22.0
Peat	.5	(9)	.5	4.3	95.2	--	(9)	(7)	--	99.5	4.8	95.2
Petroleum, crude	23.6	9.4	33.0	.8	16.5	11.7	36.3	1.0	.7	67.0	82.5	17.5

NA Not available. XX Not applicable.

[1] Data presented in this table have been calculated from the most reliable data available through April 1, 1973.

[2] Includes Cuba.

[3] Includes Yugoslavia.

[4] Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Romania, and U.S.S.R.

[5] People's Republic of China, Mongolia, North Korea, and North Vietnam.

[6] U.S. data withheld to avoid disclosing individual company confidential data and not included in total upon which percentages have been calculated.

[7] Quantity produced unknown and no reliable basis for estimate of output is available; no estimate included in total upon which percentages have been calculated.

[8] Percentages calculated from a total excluding countries listed in footnotes 4 and 5 (Communist Europe and Communist Near East and Asia).

[9] Less than .05 percent.

Table 4.—Value of world export trade in major mineral commodity group [1]

(Million U.S. dollars)

Commodity group [1]	1966	1967	1968	1969	1970
Metals:					
All ores, concentrates, and scrap	4,770	5,050	5,590	6,410	7,880
Iron and steel	9,670	10,330	11,430	13,690	17,070
Nonferrous metals	8,020	8,030	9,470	10,890	12,020
Total	22,460	23,410	26,490	30,990	36,970
Nonmetals (crude only)	1,900	2,010	2,180	2,260	2,410
Mineral fuels	18,890	20,660	23,120	24,930	28,700
Grand total	43,250	46,080	51,790	58,180	68,080
All commodities	203,400	214,190	239,140	272,710	311,390

[1] Data presented are for selected major commodity groups of the Standard International Trade Classification--Revised (SITC-R), and as such exclude some mineral commodities classified in that data array together with other (nonmineral) commodities. SITC-R categories included are as follows: Ores, concentrates, and scrap--SITC Division 28; iron and steel--SITC Division 67; nonferrous metals--SITC Division 68; nonmetals (crude only)--SITC Division 27; mineral fuels--SITC Section 3. Major items not included are the metals, metalloids, and metal oxides of SITC Division 51; manufactured fertilizers of SITC Division 56; and nonmetallic mineral manufactures of SITC Groups 661, 663, and 667.

Table 5.—Distribution of total value of export trade in major mineral commodity group, by group [1]

(Percent)

Commodity group [1]	1966	1967	1968	1969	1970
Metals:					
All ores, concentrates, and scrap	11.0	11.0	10.8	11.0	11.6
Iron and steel	22.4	22.4	22.1	23.5	25.0
Nonferrous metals	18.5	17.4	18.3	18.7	17.7
Total	51.9	50.8	51.2	53.2	54.3
Nonmetals (crude only)	4.4	4.4	4.2	3.9	3.5
Mineral fuels	43.7	44.8	44.6	42.9	42.2
Grand total	100.0	100.0	100.0	100.0	100.0

[1] For detailed definition of groups see footnote 1, table 4.

Table 6.—Growth of value of export trade in major mineral commodity group, by group[1]

(Percent increase over previous year)

Commodity group [1]	1966	1967	1968	1969	1970
Metals:					
All ores, concentrates, and scrap	4.1	5.9	10.7	14.7	22.9
Iron and steel	—.3	6.8	10.6	19.8	24.7
Nonferrous metals	19.9	.1	17.9	15.0	10.4
All metals	7.1	4.2	13.2	17.0	19.3
Nonmetals (crude only)	8.0	5.8	8.5	3.7	6.6
Mineral fuels	5.4	9.4	11.9	7.8	15.1
All major mineral commodity groups	6.4	6.5	12.4	12.3	17.0
All commodity groups	9.1	5.3	11.6	14.0	14.2

[1] For detailed definition of groups, see footnote 1, table 4.

Table 7.—Significance of trade in major mineral commodity group [1] to total trade of various world areas, 1970

Area and country [2]	Value, million U.S. dollars				Major mineral commodities share of total (percent)	
	Major mineral commodity groups [1]		All commodities			
	Exports from	Exports to	Exports from	Exports to	Exports from	Exports to
Northern North America:						
Canada	4,690	1,630	16,180	12,430	29.0	13.1
United States	5,020	8,390	42,590	38,970	11.8	21.5
Total	9,710	10,020	58,770	51,400	16.5	19.5
Latin America	[3] 5,410	1,847	12,790	11,660	[4] 42.3	15.8
Europe:						
Non-Communist:						
EEC	[5] 14,240	21,290	[5] 88,510	[5] 88,430	16.1	24.1
EFTA	[5] 5,360	10,515	[5] 40,800	[5] 48,420	13.1	21.7
Other	[5] 1,000	2,325	[5] 8,160	[5] 13,910	12.3	16.7
Subtotal	[5] 20,600	34,130	[5] 137,470	[5] 150,760	15.0	22.6
Communist	7,110	5,570	30,530	28,630	23.3	19.5
Total	27,710	39,700	168,000	179,390	16.5	22.1
Africa:						
Republic of South Africa	[6] 250	400	2,150	3,440	11.6	11.6
Other	[7] 6,390	1,510	12,310	11,890	[4] 51.9	12.7
Total	[8] 6,640	1,910	14,460	15,330	[4] 45.9	12.5
Near East	[9] 8,730	1,020	10,240	7,070	[4] 85.3	14.4
South Asia and Far East:						
Non-Communist:						
Japan	[10] 3,090	5,540	19,320	15,160	[4] 16.0	36.5
Other	[3] 2,250	2,920	13,690	18,610	[4] 16.4	15.7
Subtotal	[8] 5,340	8,460	33,010	33,770	[4] 16.2	25.1
Communist	[10] 150	710	2,370	2,860	[4] 6.3	24.8
Total	[8] 5,490	9,170	35,380	36,630	[4] 15.5	25.0
Australia and New Zealand	[3] 1,390	690	5,670	5,140	[4] 24.5	13.4
Not reported	[11] 3,000	3,723	6,080	4,770	[4] 49.3	78.1
Grand total	68,080	68,080	311,390	311,390	21.9	21.9

[1] For detailed definition of groups, see footnote 1, table 4.

[2] Regional groupings generally conform to United Nations practice; modifications and special aspects of classification scheme are as follows: (1) Latin America includes Mexico, Central America, and South America, but excludes Caribbean Islands; (2) EEC consists of Belgium, France, West Germany, Italy, Luxembourg, and the Netherlands; (3) EFTA consists of Austria, Denmark, Norway, Portugal, Sweden, Switzerland, and the United Kingdom; (4) Other non-Communist Europe consists of Finland, Greece, Iceland, Ireland, and Spain, as well as Yugoslavia (a Communist country); (5) Communist Europe includes Albania, Bulgaria, Czechoslovakia, Hungary, Poland, Romania, and the U.S.S.R.; (6) Other Africa corresponds to the United Nations category "Developing Africa"; (7) Near East corresponds to the United Nations category "Asian Middle East"; (8) Other non-Communist South Asia and Far East refers to the United Nations category "Other Asia"; (9) Communist Far East consists of the People's Republic of China, North Korea, Mongolia, and North Vietnam; (10) Previous editions of source included separate heading for "Rest of World;" however, this category is deleted in this publication and countries previously reported under that heading (Caribbean and Pacific Islands) are included under "Not reported," which is derived by subtracting all listed figures from reported totals.

[3] Partial figure; value of nonmetals excluded but presumably included under "Not reported."

[4] Percentage based on partial figure; see footnote to entry in "Exports from" value column.

[5] Data derived from United Nations World Trade Annual. V. III, 1970.

[6] Partial figure; includes mineral fuels and nometals only; totals for other commodity groups presumably included under "Not reported."

[7] Partial figure; value of iron and steel excluded, but presumably included under "Not reported."

[8] Partial figure; see exclusions as indicated by footnotes to regional detail above.

[9] Partial figure; value of mineral fuels only; totals for other commodity groups presumably included under "Not reported."

[10] Partial figure; value of metal ores, concentrates, and scrap as well as nonmetals excluded but presumably included under "Not reported."

[11] Direct arithmetic sum of the differences between world totals and individual detailed figures for each major commodity reported in source publication.

Table 8.—Export origins and destinations for major mineral commodity group [1] shipments, by value, in 1970

(Million U.S. dollars)

Area and country [2]	Exports from					Exports to				
	Metal ores, concentrates, and scrap	Iron and steel	Nonferrous metals	Nonmetals	Mineral fuels	Metal ores, concentrates, and scrap	Iron and steel	Nonferrous metals	Nonmetals	Mineral fuels
Northern North America:										
Canada	1,440	410	1,530	325	980	165	420	155	76	810
United States	940	1,270	900	320	1,590	1,090	2,110	1,680	255	3,250
Total	2,380	1,680	2,430	645	2,570	1,255	2,530	1,835	331	4,060
Latin America	930	140	1,170	(3)	3,170	75	730	315	77	650
Europe:										
Non-Communist:										
EEC	760	6,970	2,430	455	3,620	2,310	4,990	4,670	800	8,520
EFTA	460	2,130	1,730	220	820	1,070	2,280	2,340	375	4,450
Other [4]	120	[5] 340	290	40	170	180	[5] 770	360	95	920
Subtotal	1,340	9,440	4,450	715	4,610	3,560	8,040	7,370	1,270	13,890
Communist	670	2,300	750	380	3,010	760	2,230	630	290	1,660
Total [4]	2,010	11,740	5,200	1,095	7,620	4,320	10,270	8,000	1,560	15,550
Africa:										
Republic of South Africa	(3)	(3)	(3)	130	115	3	98	67	10	225
Other	465	(3)	1,660	200	3,945	10	670	130	39	660
Total [4]	465	(3)	1,660	330	4,060	13	768	197	49	885
Near East	(3)	(3)	(3)	(3)	8,730	10	410	92	18	485
South Asia and Far East:										
Non-Communist:										
Japan	(3)	2,840	205	(3)	48	1,950	220	800	180	3,050
Other	580	230	470	(3)	970	135	1,090	390	82	1,220
Subtotal [4]	580	3,070	675	(3)	1,018	2,085	1,310	1,190	262	4,270
Communist	(3)	76	46	(3)	23	26	380	190	14	97
Total	580	3,146	721	(3)	1,041	2,111	1,690	1,380	276	4,367
Australia and New Zealand	670	130	335	(3)	255	9	225	81	41	335
Not reported [4] [6]	845	234	504	340	1,254	87	447	120	58	2,368
Grand total	7,880	[5] 17,070	12,020	2,410	28,700	7,880	[5] 17,070	12,020	2,410	28,700

[1] For detailed definitions of groups, see footnote 1, table 4.

[2] For detailed definitions of areas listed below, see footnote 2, table 7.

[3] Not listed separately for this area, presumably included under "Not reported."

[4] Not reported in source but derived from data therein.

[5] Includes US $70 million as determined from separate source. United Nations World Trade Annual. V. III, 1970.

[6] Previous editions included separate divisions for "Rest of world". However, due to changes in source data, the heading "Not reported" includes those areas previously listed under "Rest of world."

Table 9.—Direction of trade in major mineral commodities [1] in 1970

(Million U.S. dollars)

Source [2]	Destination [2]									
	Northern North America			Latin America	Non-Communist Europe [3]				Communist Europe	Near East
	United States	Canada	Total [4]		EEC	EFTA	Other [4]	Total [5]		
Northern North America:										
United States	XX	796	796	564	1,290	459	211	1,960	60	48
Canada	2,530	XX	2,530	85	522	879	104	1,505	12	10
Total [4]	2,530	796	3,326	649	1,812	1,338	315	3,465	72	58
Latin America [6]	1,641	388	2,029	345	926	514	82	1,522	6	--
Europe: [3]										
Non-Communist:										
EEC	910	44	954	169	7,980	2,567	503	11,050	519	206
EFTA	346	68	414	89	1,885	1,813	287	3,985	256	71
Other [4]	70	8	78	35	377	231	34	642	116	14
Subtotal	1,326	120	1,446	293	10,242	4,611	824	15,677	891	291
Communist	29	9	38	18	937	826	332	2,095	4,095	74
Total [4]	1,355	129	1,484	311	11,179	5,437	1,156	17,772	4,986	365
Near East [7]	205	59	264	145	2,710	1,470	300	4,480	8	405
Africa:										
Republic of South Africa [7]	--	--	--	--	--	--	--	--	--	--
Other [8]	213	23	236	68	3,781	1,140	289	5,210	74	9
Total [4]	213	23	236	68	3,781	1,140	289	5,210	74	9
Far East and South Asia:										
Non-Communist:										
Japan [6] [9]	986	64	1,050	228	198	98	122	418	88	92
Other	294	14	308	6	143	59	23	225	64	44
Subtotal [4]	1,280	78	1,358	234	341	157	145	643	152	136
Communist [6] [9]	--	--	--	--	23	3	2	28	61	2
Total [4]	1,280	78	1,358	234	364	160	147	671	213	138
Australia and New Zealand [6]	88	2	90	7	121	162	16	299	8	4
Rest of world [4]	1,073	151	1,224	88	397	294	20	711	203	36
Grand total	8,385	1,626	10,011	1,847	21,290	10,515	2,325	34,130	5,570	1,015

See footnotes at end of table.

Table 9.—Direction of trade in major mineral commodities[1] in 1970—Continued

(Million U.S. dollars)

Source[2]	Destination[2]: Africa			Non-Communist Far East and South Asia			Communist Far East	Australia and New Zealand	Rest of world[4]	Grand total[5]
	Republic of South Africa	Other	Total[4]	Japan	Other	Total[4]				
Northern North America:										
United States	32	60	92	1,037	279	1,316	--	45	139	5,020
Canada	33	4	37	366	90	456	19	50	(10)	4,690
Total[4]	65	64	129	1,403	369	1,772	19	95	125	9,710
Latin America[6]	--	24	24	390	23	413	1	--	1,070	5,410
Europe:[3]										
Non-Communist:										
EEC	40	492	532	53	115	168	114	16	512	14,240
EFTA	37	118	155	64	104	168	75	66	81	5,360
Other[4]	2	23	25	1	--	1	5	2	12	930
Subtotal	79	633	712	118	219	337	194	84	605	20,530
Communist	--	136	136	191	76	267	148	1	238	7,110
Total[4]	79	769	848	309	295	604	342	85	843	27,640
Near East[7]	190	260	450	1,860	610	2,470	--	220	288	8,730
Africa:										
Republic of South Africa[7]	XX	--	--	--	--	--	--	--	250	250
Other[8]	17	121	138	360	45	405	61	2	187	6,390
Total[4]	17	121	138	360	45	405	61	2	437	6,640
Far East and South Asia:										
Non-Communist:										
Japan[6] [9]	41	106	147	XX	708	708	261	102	(11)	3,090
Other	--	24	24	853	600	1,453	5	84	37	2,250
Subtotal[4]	41	130	171	853	1,308	2,161	266	186	33	5,340
Communist[6] [9]	--	1	1	20	22	42	--	--	16	150
Total[4]	41	131	172	873	1,330	2,203	266	186	49	5,490
Australia and New Zealand[6]	9	6	15	670	97	767	3	80	117	1,390
Rest of world[4]	2	134	136	335	150	485	15	23	149	3,070
Grand total	403	1,509	1,912	6,200	2,919	9,119	707	691	3,078	68,080

XX Not applicable.

[1] For detailed listing of commodities included, see footnote 1, table 4. It should be noted that certain commodities excluded for specific areas indicated by footnote 4 through 11 are presumably included in grand totals.

[2] For detailed definitions of areas listed, see footnote 2, table 7.

[3] Due to discrepancy in published data of original source from which this table was compiled, figures for EFTA and "Other" Europe category were derived from the United Nations World Trade Annual. V. III, 1970.

[4] Not reported in source, derived from data therein.

[5] As reported in source, detail may not add to listed figure.

[6] Excludes crude nonmetals.

[7] Includes mineral fuels only.

[8] Excludes iron and steel.

[9] Excludes metal ores and scrap.

[10] Summation of totals for countries and regions listed exceeds grand total by US$14 million; reason for such discrepancy is unaccounted for.

[11] Summation for totals for countries and regions listed exceeds grand total by US$4 million; reason for such discrepancy is unaccounted for.

Table 10.—Iron ore consumption by selected major country

(Million metric tons)

Country	1969	1970	1971
European Economic Community:			
Belgium	19.4	18.7	15.5
France	43.7	45.4	42.4
Germany, West	47.7	47.2	42.3
Italy	10.0	10.2	[e] 9.9
Luxembourg	14.8	14.5	14.2
Netherlands	4.9	5.2	5.6
Total	140.5	141.2	129.9
European Free Trade Association:			
Austria	5.4	5.6	[e] 5.7
Norway	.9	.9	1.1
Portugal	.3	.3	[e] .3
Sweden [e]	6.8	6.9	7.0
United Kingdom	30.4	32.0	27.5
Total	43.8	45.7	41.6
Other non-Communist Europe:			
Finland	1.7	1.6	1.4
Spain	6.8	7.6	[e] 8.6
Total	8.5	9.2	10.0
Communist Europe:			
Czechoslovakia [e]	13.2	13.2	13.3
Hungary	3.2	5.7	3.5
Poland	12.9	12.1	[e] 12.0
U.S.S.R.[e]	150.0	160.0	165.0
Yugoslavia	2.1	2.4	2.4
Total	181.4	193.4	196.2
Other:			
Japan	73.6	86.1	96.3
Turkey	1.0	[e] 1.2	1.3
United States	130.6	125.2	[e] 113.4
Total	205.2	212.5	211.0
Grand total	579.4	602.0	588.7

[e] Estimate.

Source: United Nations Economic Commission for Europe. Quarterly Bulletin of Steel Statistics for Europe. V. 22, No. 4, New York, 1972.

Table 11.—Iron and steel scrap consumption by selected major country

(Thousand metric tons)

Country	1969	1970	1971
European Economic Community:			
Belgium [1, 2]	3,266	3,487	3,467
France [3]	8,015	8,789	7,998
Germany, West [4]	23,479	23,684	21,176
Italy [2, 4]	11,623	11,308	[e] 10,742
Luxembourg [1, 4]	1,563	1,663	1,545
Netherlands [1, 4, 5]	2,110	2,281	2,227
Total	50,056	51,212	47,155
European Free Trade Association:			
Austria [2, 4]	1,525	1,551	[1, e] 1,621
Denmark [2, 4]	527	435	[1] 520
Norway [2, 4]	429	443	[1] 484
Portugal	123	143	[e] 165
Sweden [2, 4]	3,258	3,197	[1] 2,971
United Kingdom [1, 4]	19,162	20,220	17,993
Total	25,024	25,989	23,754
Other non-Communist Europe:			
Finland [1, 4]	619	637	586
Spain [4]	[e] 4,132	4,775	[e] 5,116
Total	4,751	5,412	5,702
Communist Europe:			
Czechoslovakia [3]	4,491	4,584	4,534
Hungary [1, 4]	1,971	2,000	1,937
Poland [1, 4]	6,373	6,488	[e] 6,618
Romania [1, 4, 5]	[e] 2,712	[r, e] 2,799	2,995
U.S.S.R. [6]	42,414	43,362	[e] 44,117
Yugoslavia [1, 4]	1,330	1,482	1,546
Total	59,291	60,715	61,747
Other:			
Japan	37,001	40,994	33,406
Turkey	147	[e] 150	[e] 155
United States	86,017	77,619	[e] 75,000
Total	123,165	118,763	108,561
Grand total	262,287	[r] 262,091	246,919

[e] Estimate. [r] Revised.

[1] Excludes scrap consumption by rerollers.

[2] Excludes scrap consumption by iron foundries.

[3] Scrap consumption in blast furnaces and steelworks only.

[4] Excludes scrap consumption by industry other than iron and steel.

[5] Excludes scrap consumption in blast furnaces.

[6] Consumption in blast furnaces and open hearth furnaces only (excludes consumption in other types of steel furnaces, rerolling mills, iron foundries, and industries other than the iron and steel industries).

Source: United Nations Economic Commission for Europe. Quarterly Bulletin of Steel Statistics for Europe. V. 22, No. 4, New York, 1972.

Table 12.—Estimated world [1] consumption of major nonferrous metals

Commodity		1969	1970 [r]	1971
Aluminum [2]	thousand metric tons	8,997	9,397	10,198
Copper [3]	do	[r] 7,065	7,220	7,195
Lead [4]	do	3,448	3,542	3,546
Zinc [5]	do	4,760	4,641	4,688
Tin [6]	thousand long tons	181	178	184

[r] Revised.

[1] In general, figures are totals for major consuming countries only; sum of consumption by excluded minor consumers may be significant; data included for Communist countries (except Yugoslavia) are listed as conjectural in source.

[2] Apparently includes secondary metal.

[3] Primary and secondary refined metal.

[4] Chiefly primary, but including some secondary.

[5] Primary and secondary slab.

[6] Primary only, as reported by the International Tin Council. Communist countries (except Yugoslavia) are excluded; consumption of primary and secondary tin by these countries is estimated at about 60,000 tons annually.

Source: Yearbook of the American Bureau of Metal Statistics. Fifty-first Annual Issue for the Year 1971. New York, 1972, 148 pp.

Table 13.—World energy consumption,[1] by energy source

(Million metric tons of standard coal equivalent unless otherwise specified)

Area [2] and year	Solid fuels	Liquid fuels	Natural and imported gas	Hydro, nuclear, and imported electricity	Total energy	
					Aggregate [1]	Per capita (kilograms)
Market economy:						
North America:						
1966	471	834	699	42	2,045	9,441
1967	463	875	736	46	2,119	9,668
1968	481	930	790	47	2,249	10,178
1969	490	976	853	52	2,371	10,593
1970	495	1,026	897	54	2,472	10,923
Other America:						
1966	7	65	10	5	87	610
1967	7	67	11	5	90	615
1968	7	75	12	5	99	655
1969	8	82	13	6	107	693
1970	8	84	14	7	112	705
Caribbean America:						
1966	4	70	31	2	108	980
1967	5	75	34	2	116	1,024
1968	5	83	34	3	126	1,078
1969	6	86	36	3	131	1,087
1970	5	96	39	3	144	1,170
Western Europe:						
1966	486	518	33	43	1,080	3,122
1967	459	550	41	44	1,094	3,141
1968	456	602	58	46	1,162	3,313
1969	456	663	80	46	1,245	3,522
1970	441	753	108	48	1,351	3,791
Africa:						
1966	53	36	2	2	92	294
1967	54	37	2	2	94	291
1968	56	38	2	2	99	299
1969	57	40	2	3	102	299
1970	59	45	2	3	109	311
Near East:						
1966	6	34	7	(3)	48	508
1967	6	38	8	(3)	52	537
1968	6	40	11	1	58	585
1969	7	42	14	1	64	625
1970	7	44	26	1	78	738
Far East:						
1966	150	170	10	13	343	340
1967	159	202	10	12	384	371
1968	164	236	12	13	425	401
1969	175	273	12	14	474	437
1970	178	318	15	15	526	473
Oceania:[4]						
1966	32	28	(3)	2	63	3,523
1967	33	30	(3)	2	66	3,630
1968	34	33	(3)	2	70	3,779
1969	35	35	(3)	3	73	3,875
1970	35	38	2	3	78	4,034
Total market economy:						
1966	1,209	1,756	790	109	3,865	1,721
1967	1,185	1,873	841	114	4,014	2,003
1968	1,211	2,038	918	119	4,286	2,070
1969	1,233	2,196	1,009	127	4,566	2,137
1970	1,228	2,404	1,103	134	4,869	2,207

See footnotes at end of table.

Table 13.—World energy consumption,[1] by energy source—Continued

(Million metric tons of standard coal equivalent unless otherwise specified)

Area [2] and year	Solid fuels	Liquid fuels	Natural and imported gas	Hydro, nuclear, and imported electricity	Total energy	
					Aggregate [6]	Per capita (kilograms)
Centrally planned economy:						
Europe: [5]						
1966	734	297	218	13	1,262	3,756
1967	737	325	242	13	1,316	3,881
1968	742	350	263	15	1,369	3,998
1969	762	378	284	16	1,441	4,171
1970	791	413	312	18	1,534	4,404
Asia: [6]						
1966	352	22	(3)	6	380	504
1967	253	20	(3)	5	278	363
1968	332	27	(3)	5	364	466
1969	364	36	(3)	5	406	510
1970	395	37	(3)	6	440	543
Total centrally planned economy:						
1966	1,085	319	219	19	1,642	1,507
1967	990	345	242	18	1,595	1,442
1968	1,074	377	263	20	1,733	1,542
1969	1,126	414	285	21	1,847	1,618
1970	1,186	451	313	24	1,974	1,704
World total:						
1966	2,294	2,075	1,010	128	5,507	1,649
1967	2,175	2,218	1,083	132	5,608	1,648
1968	2,284	2,414	1,182	138	6,019	1,734
1969	2,359	2,611	1,295	149	6,413	1,811
1970	2,415	2,854	1,417	157	6,843	1,897

[1] In most cases data are aggregates of country figures representing apparent inland consumption—the purely arithmetic result of adding production and imports and subtracting from this sum the total of exports, bunker loadings, and additions to stocks (where the latter are known). All totals in this table are reported in source and may not represent the sum of listed parts owing to rounding and/or omission from detail of minor quantities not listed separately. A large number of the entries in this table have been revised from those appearing in previous editions of this chapter owing to revisions published in new edition of source; such revision have not been identified as such by footnotes.

[2] Areas listed are those appearing in source and have not been conformed in scope to standard terms used elsewhere in the Minerals Yearbook, except that the source term "Western Asia" has been converted to "Near East."

[3] Nil or less than ½ unit.

[4] All figures revised from those presented in 1970 edition of this chapter.

[5] Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Romania, and the U.S.S.R.

[6] Peoples' Republic of China, North Vietnam, Mongolia, and North Korea.

Source: United Nations. World Energy Supplies 1961–70. Statistical Papers, Series J, No. 15, New York 1971, pp. 6–9.

Table 14.—Reserves of major mineral commodities, 1971

(Thousand metric tons unless otherwise specified)

Commodity	World total	Market economy countries	Centrally planned economies	Country distribution of principal reserves in market economy countries
METALS				
Aluminum, bauxite, gross weight million metric tons	11,900	11,200	700	Australia 4,100; Guinea 4,100; Jamaica 800.
Chromite, gross weight	2,449,000	2,402,000	47,000	Republic of South Africa 1,814,000; Southern Rhodesia 544,000.
Cobalt, metal content	2,480	1,940	540	Zaire (formerly Congo-Kinshasa) 680; New Caledonia and Australia 670; Zambia 350.
Copper, metal content	308,000	272,000	36,000	United States 73,000; Chile 51,000; Canada 27,000; Zambia 24,000; Peru 20,000.
Iron ore:				
Gross weight million metric tons	254,347	136,734	117,613	Canada 32,405; Brazil 24,852; Australia 14,512.
Metal content do	87,743	56,490	31,253	Brazil 13,424; Canada 10,639; Australia 9,070.
Lead, metal content	93,000	78,000	15,000	United States 33,000; Canada 13,000; Australia 12,000.
Molybdenum, metal content	4,271	4,271	--	United States 2,858; Chile 816; Canada 454.
Nickel, metal content	[1]68,000	43,000	[1]25,000	New Caledonia 15,000; Canada 9,000; United States 1,000.
Tin, metal content thousand long tons	4,130	3,415	715	Thailand 1,400; Malaysia 600; Indonesia 550.
Tungsten, metal content	1,248	281	967	United States 79; Republic of Korea 46; Bolivia 39.
Zinc, metal content	118,000	100,000	18,000	Canada 31,000; United States 27,000; Australia 9,000.
NONMETALS				
Phosphate rock million metric tons	93,939	73,074	20,865	Morocco 29,937; Spanish Sahara 26,762; United States 7,121.
Potash do	118,896	64,465	54,431	Canada 45,359; West Germany 8,165; United States 417.
Sulfur	1,219,000	1,133,000	86,000	Canada 391,000; United States 76,000; Japan 41,000.
MINERAL FUELS				
Coal:				
Anthracite and bituminous million metric tons	1,809,143	755,222	1,053,921	United States 544,049; West Germany 56,396; Republic of South Africa 33,203.
Lignite do	413,343	285,116	128,227	United States 202,958; West Germany 30,006; Australia 20,276.
Natural gas billion cubic feet	[2]1,487,918	1,057,238	[2]430,680	United States 290,746; Netherlands 87,500; Canada 53,376.
Petroleum million 42-gallon barrels	546,000	487,000	59,000	Saudi Arabia 145,000; Kuwait 82,000; Iran 60,000; United States 39,000.

[1] Includes 16,329 thousand metric tons in Cuba.

[2] Includes 423,000 billion cubic feet in the U.S.S.R.

Source: United States Bureau of Mines Commodity Data Summary, January 1972, 168 pp.

Table 15.—Annual investment expenditure in the steel industry for selected countries

(Million dollars)

Country or country group	1969	1970
European Economic Community (EEC)	1,039	1,688
European Free Trade Association (EFTA) [1]	237	465
Other countries:		
Canada	105	175
Finland	6	48
Ireland	5	NA
Japan [2]	1,494	1,889
Spain	221	253
Turkey	NA	31
United States	2,136	2,000

NA Not available.

[1] Totals given exclude expenditures in Denmark and Switzerland and any non-British Steel Corp. investment in the United Kingdom.

[2] Japanese fiscal years.

Source: Organization for Economic Cooperation and Development. The Iron and Steel Industry in 1970 and Trends in 1971 and the previous edition of the same publication covering 1969.

Table 16.—Non-Communist world petroleum capital expenditures and exploration expenses by geographic area

(Million dollars)

	1969	1970	1971
United States:			
Capital expenditures	8,175	8,225	7,250
Exploration expenses	725	665	715
Total	8,900	8,890	7,965
Other Western Hemisphere:			
Capital expenditures	2,715	2,760	3,350
Exploration expenses	270	275	255
Total	2,985	3,035	3,605
Western Europe:			
Capital expenditures	2,480	3,260	4,150
Exploration expenses	125	100	75
Total	2,605	3,360	4,225
Africa:			
Capital expenditures	825	790	975
Exploration expenses	85	100	150
Total	910	890	1,125
Near East:			
Capital expenditures	730	565	825
Exploration expenses	50	50	50
Total	780	615	875
Far East:			
Capital expenditures	1,500	2,050	2,500
Exploration expenses	125	150	150
Total	1,625	2,200	2,650
Unspecified: Capital expenditures (no exploration expenses)	1,950	2,475	2,750
Total:			
Capital expenditures	18,375	20,125	21,800
Exploration expenses	1,380	1,340	1,395
Total	19,755	21,465	23,195

Source: Energy Division, Chase Manhattan Bank, N.A. Capital Investments of the World Petroleum Industry, 1971, pp. 24–31.

Table 17.—Non-Communist world petroleum industry capital expenditures by industry sector and exploration expenses

(Million dollars)

	1969	1970	1971
Capital expenditures:			
Production:			
Crude oil and natural gas	7,075	6,650	6,520
Natural gasoline plants	465	580	695
Pipelines	910	850	1,200
Marine	2,090	2,615	2,875
Refineries	3,210	4,000	4,755
Chemical plants	1,310	1,525	1,535
Marketing	2,805	3,220	3,380
Other	510	685	840
Total	18,375	20,125	21,800
Exploration expenses	1,380	1,340	1,395
Grand total	19,755	21,465	23,195

Source: Energy Division, Chase Manhattan Bank, N.A. Capital Investments of the World Petroleum Industry, 1971, pp. 24–25.

Table 18.—U.S. direct foreign investment in mineral industries: Value, earnings, and income

(Million dollars)

Area and country	Mining, smelting, and refining			Petroleum		
	Value	Earnings [1]	Income [2]	Value	Earnings [1]	Income [2]
1968 total	5,435	795	644	18,887	2,449	2,271
1969 total	[r] 5,676	782	664	19,882	2,452	2,638
1970 total	6,168	675	553	21,714	2,935	2,608
1971: [p]						
Canada	3,265	206	170	5,134	371	149
Latin America and other Western Hemisphere:						
Latin American Republics:						
Chile	452	3	7	NA	NA	NA
Venezuela	NA	NA	NA	1,634	370	366
Other	904	70	105	1,669	93	55
Subtotal [3]	1,356	73	112	3,303	463	421
Other Western Hemisphere	760	103	108	891	48	23
Total	2,116	176	219	4,194	511	444
Europe:						
European Economic Community	13	NA	NA	2,927	−25	90
United Kingdom	8	NA	NA	2,192	70	46
Other West Europe	57	NA	NA	1,083	−38	−6
Total	78	2	--	6,202	7	130
Africa:						
South Africa, Republic of	108	27	21	189	NA	NA
Other	386	32	15	2,095	515	444
Total	494	59	36	2,284	515	444
Near East	3	--	--	1,465	1,854	1,877
Far East and Pacific:						
Japan	--	--	--	637	29	11
Australia	602	59	53	NA	NA	NA
New Zealand	8	--	--	NA	NA	NA
Other	155	2	2	1,410	167	118
Total	765	61	55	2,047	196	129
International shipping	--	--	--	2,140	461	257
Grand total [4]	6,720	504	484	24,258	3,982	3,459

[p] Preliminary. [r] Revised. NA Not available.

[1] Sum of U.S. share in net earnings of subsidiary and branch profits.

[2] Sum of interest, dividends, and branch earnings.

[3] Partial figure; excludes figures for detail indicated as not available.

[4] Detail may not add to totals shown because of independent rounding and exclusion of some data in detail.

Table 19.—World merchant fleet distribution, by type [1]

	1967	1968	1969	1970	1971
Number of vessels:					
Tankers	3,740	3,895	4,071	4,232	4,431
Bulk carriers	2,368	2,609	2,748	2,954	3,218
Freighters	10,963	11,052	10,980	10,998	11,095
Other	1,729	1,805	1,771	1,796	1,800
Total	18,800	19,361	19,570	19,980	20,544
Gross tonnage:					
Tankers thousand tons	65,804	71,641	79,457	88,896	99,105
Bulk carriers do	31,644	37,596	41,746	47,199	55,009
Freighters do	61,821	62,559	62,960	63,159	64,038
Other do	12,253	12,446	12,084	12,147	12,150
Total do	171,522	184,242	196,247	211,401	230,302
Deadweight tonnage:					
Tankers do	105,542	117,135	133,421	153,075	173,196
Bulkcarriers do	49,638	59,926	67,638	77,173	90,962
Freighters do	86,107	86,702	87,250	87,428	88,305
Other do	9,116	9,447	9,214	9,323	9,276
Total do	250,403	273,210	297,523	326,999	361,739

[1] Maritime Administration classification. Tankers include whaling tankers. Vessels shown here as "Other" include combination passenger and cargo, combination passenger and refrigerated cargo, and refrigerated freighters. Contribution of these vessels to mineral commodity trade is regarded as unimportant. Data are as of December 31 of year indicated.

Table 20.—World shipping of tanker and dry cargo by loadings and unloadings

(Million metric tons)

	1967	1968	1969	1970	1971
Loaded:					
Tanker cargo	1,023	1,141	1,276	1,442	1,537
Dry cargo	887	966	1,036	1,166	1,170
Total	1,910	2,107	2,312	2,608	2,707
Unloaded:					
Tanker cargo	994	1,113	1,243	1,400	1,492
Dry cargo	898	972	1,024	1,133	1,150
Total	1,892	2,085	2,267	2,533	2,642

Source: United Nations. Monthly Bulletin of Statistics, V. XXXII, January 1973, p. xxiii.

Table 21.—World shipping of tanker cargo by region

(Million metric tons)

Region	Loadings					Unloadings				
	1967	1968	1969	1970	1971	1967	1968	1969	1970	1971
Developed market economies:										
Australia, New Zealand	1	2	1	1	2	23	24	25	21	16
Canada	1	--	--	1	2	15	15	16	15	18
Japan	1	--	1	1	1	119	141	166	201	223
South Africa, Republic of	--	--	--	--	--	9	10	10	12	16
United States	8	4	4	5	3	128	145	156	161	173
Western Europe	62	70	79	98	97	497	554	620	705	732
Other	--	1	1	6	12	4	3	3	7	13
Total	73	77	86	112	117	795	892	996	1,122	1,191
Developing market economies:										
Caribbean	54	54	57	63	62	68	71	79	89	97
Far East	35	43	51	59	68	52	64	70	78	88
Near East	470	529	586	662	768	11	11	12	12	11
North Africa	139	177	210	227	182	16	16	17	17	17
Other Africa	8	12	35	63	84	12	14	14	15	14
Venezuela	175	176	178	181	173	--	--	--	--	--
Other Latin America	12	10	11	11	11	29	33	35	42	44
Other	--	--	--	--	1	2	1	3	3	3
Total	893	1,001	1,128	1,266	1,349	190	210	230	256	274
Centrally planned economies:										
U.S.S.R	54	57	58	61	69	--	--	1	3	5
Other	3	5	4	4	3	9	11	17	19	22
Total	57	62	62	65	72	9	11	18	22	27

Source: United Nations. Monthly Bulletin of Statistics. V. XXVII, January 1973, p. xxiii.

Table 22.—World shipping of dry cargo

(Million metric tons)

Region	Loadings					Unloadings				
	1967	1968	1969	1970	1971	1967	1968	1969	1970	1971
Developed market economies:										
Australia, New Zealand	43	51	72	93	114	15	16	16	16	17
Canada	72	78	70	95	92	31	34	36	39	37
Japan	26	30	40	41	51	165	179	204	235	238
South Africa, Republic of	13	14	12	13	15	5	4	4	6	8
United States	163	173	177	213	183	121	131	125	132	133
Western Europe	195	222	231	239	239	355	389	416	460	452
Other	2	2	3	2	4	2	3	5	3	2
Total	514	570	605	696	698	694	756	806	891	887
Developing market economies:										
Caribbean	26	25	27	32	30	10	11	11	13	14
Far East	68	72	81	89	89	64	63	61	62	64
Near East	7	8	8	10	10	17	17	19	20	23
North Africa	25	28	29	29	31	17	17	17	19	21
Other Africa	56	66	71	77	81	4	5	19	22	26
Venezuela	19	17	21	23	22	3	4	4	4	5
Other Latin America	78	84	93	106	106	25	29	31	34	37
Other	6	8	10	9	9	18	14	2	2	2
Total	285	308	340	375	378	153	160	164	176	192
Centrally planned economies:										
U.S.S.R	45	44	47	46	44	10	11	10	11	10
Other	43	44	44	48	49	41	44	44	55	60
Total	88	88	91	94	93	51	55	54	66	70

Source: United Nations. Monthly Bulletin of Statistics. V. XXVII, January 1973, p. xxiii.

Table 23.—Distribution of world oil tanker tonnage, by size group [1]

Size group (deadweight tons)	1966		1971			
			In service		New building in progress or on order at yearend	
	Million deadweight tons	Percent of total	Million deadweight tons	Percent of total	Million deadweight tons [2]	Percent of total
Under 25,000	30.0	30.2	28.5	16.3	1.0	1.1
25,000–45,000	25.3	25.5	28.0	16.0	3.4	3.8
45,000–65,000	21.2	21.3	22.6	12.9	--	--
65,000–125,000	21.8	21.9	39.4	22.5	3.6	4.1
125,000–205,000	1.1	1.1	12.0	6.8	5.0	5.6
205,000–285,000	--	--	42.5	24.2	65.2	73.6
285,000 and over	--	--	2.3	1.3	10.4	11.8
Total	[3] 99.4	100.0	175.3	100.0	88.6	100.0

[1] Includes vessels 2,000 deadweight tons and over.

[2] Excludes 21.5 million deadweight tons in bulk (multiple-cargo) carriers.

[3] Data differ slightly from total given in table 19 because of difference in source.

Source: British Petroleum Co. Ltd. BP Statistical Review of the World Oil Industry. Baynard Press, London, 1966, p. 15; 1971, p. 14.

Table 24.—Commercial ocean traffic through the Panama Canal in terms of number of transits and total cargo moved, by type of vessel

	Ore ships	Tankers	Combination carriers	Container cargo ships	Dry bulk carriers	General cargo ships	Other	Total
1970								
Number of transits:								
In ballast:								
Atlantic to Pacific	1	42	14	1	29	128	595	810
Pacific to Atlantic	--	764	--	--	219	153	116	1,252
Total	1	806	14	1	248	281	711	2,062
Laden:								
Atlantic to Pacific	--	932	99	66	1,274	3,213	630	6,214
Pacific to Atlantic	6	216	18	70	909	3,040	1,123	5,382
Total	6	1,148	117	136	2,183	6,253	1,753	11,596
In ballast and laden:								
Atlantic to Pacific	1	974	113	67	1,303	3,341	1,225	7,024
Pacific to Atlantic	6	980	18	70	1,128	3,193	1,239	6,634
Grand total	7	1,954	131	137	2,431	6,534	2,464	13,658
Cargo moved (thousand metric tons):								
Atlantic to Pacific	--	14,721	4,911	281	34,271	19,297	1,363	74,844
Pacific to Atlantic	156	3,377	569	334	17,164	16,685	2,962	41,247
Total	156	18,098	5,480	615	51,435	35,982	4,325	116,091
1971								
Number of transits:								
In ballast:								
Atlantic to Pacific	1	39	5	1	100	162	566	874
Pacific to Atlantic	--	780	1	--	115	160	138	1,194
Total	1	819	6	1	215	322	704	2,068
Laden:								
Atlantic to Pacific	--	946	59	121	1,314	3,328	544	6,312
Pacific to Atlantic	2	198	5	109	1,060	3,139	1,126	5,639
Total	2	1,144	64	230	2,374	6,467	1,670	11,951
In ballast and laden:								
Atlantic to Pacific	1	985	64	122	1,414	3,490	1,110	7,186
Pacific to Atlantic	2	978	6	109	1,175	3,299	1,264	6,833
Grand total	3	1,963	70	231	2,589	6,789	2,374	14,019
Cargo moved (thousand metric tons):								
Atlantic to Pacific	--	14,848	2,985	709	34,856	21,000	1,141	75,539
Pacific to Atlantic	84	3,329	187	694	19,001	18,772	2,928	44,995
Total	84	18,177	3,172	1,403	53,857	39,772	4,069	120,534

Source: Panama Canal Co. Annual Reports for 1970 and 1971.

Table 25.—Movement of mineral commodities through the Panama Canal, by commodity type and direction of movement

(Thousand metric tons)

Commodity	Atlantic to Pacific			Pacific to Atlantic			Total		
	1969	1970	1971	1969	1970	1971	1969	1970	1971
METALS									
Aluminum:									
Bauxite and alumina	1,243	1,615	1,256	132	157	450	1 375	1,772	1,706
Metal, except scrap	101	65	76	74	183	94	175	248	170
Chromium, chromite	14	2	10	155	161	209	169	163	219
Copper:									
Ore and concentrate	68	101	46	170	187	249	238	288	295
Metal, except scrap	30	12	15	701	666	765	731	678	780
Iron and steel:									
Iron ore	179	289	575	2,924	3,993	3,557	3,103	4,282	4,132
Pig iron, steel ingots and other crude forms, except scrap	1,248	1,325	293	18	19	37	1,266	1,344	330
Semimanufactures (excluding tinplate)	1,881	2,002	1,890	5,510	6,243	6,494	7,391	8,245	8,384
Lead:									
Ore and concentrate	19	12	6	128	170	193	147	182	199
Metal, except scrap	3	5	6	147	183	253	150	188	259
Manganese ore and concentrate	109	99	208	133	76	122	242	175	330
Tin:									
Ore and concentrate	1	2	6	89	78	85	90	80	91
Metal (including tinplate)	145	134	129	94	90	103	239	224	232
Zinc:									
Ore and concentrate	150	140	165	153	216	349	303	356	514
Metal, except scrap	19	11	8	148	153	144	167	164	152
Other and unclassified:									
Ore and concentrate	91	54	115	533	623	789	624	677	904
Metal, except scrap	35	31	49	102	118	172	137	149	221
Metal scrap, all metals	2,683	3,975	2,689	33	34	18	2,716	4,009	2,707
NONMETALS									
Asbestos	193	229	262	46	50	55	239	279	317
Borax	9	8	10	340	456	398	349	464	408
Cement	116	169	170	13	15	15	129	184	185
Clays and clay products:									
Fire clay and kaolin	230	301	328	21	35	35	251	336	363
Brick and tile	59	77	79	136	151	131	195	228	210
Diatomaceous earth	8	4	4	55	52	52	63	56	56
Fertilizer materials:									
Nitrogenous:									
Ammonium compounds	390	350	350	16	58	26	406	408	376
Sodium nitrate	21	23	23	392	388	466	413	411	489
Phosphatic	4,737	3,792	4,544	94	6	2	4,831	3,798	4,546
Potassic	155	186	305	721	509	429	876	695	734
Unclassified	636	794	891	43	184	82	679	978	973
Sodium compounds:									
Salt	196	144	117	376	512	505	572	656	622
Other	99	77	118	60	29	23	159	106	141
Sulfur	193	213	172	182	306	428	375	519	600
MINERAL FUELS AND RELATED MATERIALS									
Coal and coke	16,522	21,648	22,181	30	26	382	16,552	21,674	22,563
Petrochemicals	479	354	324	126	237	294	605	591	618
Petroleum:									
Crude	6,092	4,199	4,712	581	1,710	1,330	6,673	5,909	6,042
Refinery products	10,168	10,526	9,514	1,065	1,513	1,859	11,233	12,039	11,373
Total	48,322	r 52,968	51,646	15,541	r 19,587	20,595	63,863	r 72,555	72,241

r Revised.

Source: Panama Canal Co. Annual Report, 1971, pp. 48–51.

Table 26.—Indexes of ocean freight rates

(1963 = 100, unless otherwise specified)

	London tanker brokers panel	Trip charter					Time charter				
		West Germany		Italy (general)	Norway		United Kingdom[1]				Norway (dry cargo)
		Dry cargo	Tankers		Dry cargo	Tankers	General	9,000–16,000 deadweight tons	20,000–40,000 deadweight tons	Over 40,000 deadweight tons	
1968	108	100	158	95	102	142	100	100	100	100	118
1969	90	100	127	96	94	119	100	99	98	103	114
1970:[2]											
First quarter	101	157	164	157	133	180	148	119	146	164	145
Second quarter	106	151	231	150	134	215	193	140	175	227	169
Third quarter	134	159	335	147	142	322	206	139	182	254	190
Fourth quarter	150	130	291	116	132	280	176	138	167	202	174
Annual average	119	146	250	142	122	243	181	134	168	181	166
1971:[2]											
First quarter	120	113	198	96	97	173	135	111	126	157	156
Second quarter	119	92	109	79	82	99	87	94	89	81	145
Third quarter	113	85	95	76	83	88	75	81	82	67	114
Fourth quarter	107	91	135	74	77	134	75	82	73	72	100
Annual average	118	99	144	87	90	133	93	92	93	94	132

[1] The United Kingdom figures are shown with original base 1968 = 100. Table is further subdivided into vessel tonnage classes of deadweight tons, rather than commodity classes.

[2] Quarterly figures are for the last month in the quarter except for United Kingdom figures that are averages for the quarter indicated.

Source: United Nations. Monthly Bulletin of Statistics. September 1971, p. xvi; and June 1972, p. xxii.

Table 27.—Nonferrous metal prices in the United States

(Average, cents per pound, except where otherwise noted)

Year and month	Aluminum[1]	Copper[2]	Lead[3]	Zinc[4]	Tin[5]	Silver[6]
1969	27.176	47.534	14.695	14.600	164.498	179.067
1970	28.716	57.700	15.419	15.319	174.205	177.082
1971:						
January	29.000	51.025	13.300	15.000	161.638	163.955
February	29.000	49.850	13.300	15.000	162.882	160.032
March	29.000	50.050	13.300	15.068	166.957	166.904
April	29.000	52.330	13.300	15.500	168.976	172.595
May	29.000	52.215	13.300	15.775	166.025	166.670
June	29.000	52.215	13.446	16.000	164.477	160.809
July	29.000	(7)	13.934	16.190	166.417	158.076
August	29.000	52.275	13.918	17.000	166.074	158.660
September	29.000	52.264	13.916	17.000	167.286	142.143
October	29.000	52.215	13.916	17.000	167.697	133.579
November	29.000	51.620	13.877	17.000	175.388	131.989
December	29.000	49.699	(8)	17.000	174.357	139.352
Annual average	29.000	51.433	(8)	16.128	167.348	154.564

[1] Unalloyed ingot, 99.5 percent, delivered United States.

[2] Electrolytic copper, domestic refineries, Atlantic Seaboard.

[3] Refined lead, St. Louis.

[4] Prime western slab, f.o.b., East St. Louis.

[5] Straits tin, New York.

[6] Cents per troy ounce, 0.999 fine, New York.

[7] Average suspended.

[8] Price discontinued December 13, 1971. Effective December 13, 1971, one delivered price, nationwide, replaced delivered New York basis quotations. For December of 1971 the nationwide monthly average was 13.815 cents per pound.

Source: Yearbook of the American Bureau of Metal Statistics. Fifty-first Annual Issue for the Year 1971. New York, 1972, 148 pp.

Table 28.—Nonferrous metal prices in the United Kingdom

(Average £ per metric ton unless otherwise noted) [1]

Year and month	Aluminum [2]	Copper [3]	Lead [4]	Zinc [5]	Tin [6]	Silver [7]
1969	244.525	611.442	120.762	119.237	1,428.907	75.323
1970	255.866	578.617	124.430	121.175	1,506.213	73.778
1971:						
January	257.200	420.95	109.24	118.406	1,444.900	67.945
February	257.200	425.15	110.74	113.23	1,443.40	65.99
March	257.200	476.78	111.32	118.09	1,469.91	68.639
April	257.200	521.50	111.53	118.01	1,485.10	71.150
May	257.200	464.38	110.08	119.86	1,467.05	68.680
June	257.200	447.52	110.42	128.48	1,437.50	66.291
July	257.200	464.75	108.98	132.22	1,440.50	65.018
August	257.200	451.24	106.03	132.41	1,420.43	63.367
September	257.200	427.80	96.68	125.47	1,416.91	57.364
October	257.200	417.98	91.94	134.98	1,420.62	53.195
November	257.200	406.70	88.78	137.98	1,413.73	52.568
December	257.200	410.93	91.32	141.97	1,417.77	54.823
Annual average	257.200	444.43	103.79	126.96	1,437.97	63.086

[1] London Metal Exchange, average settlement prices.
[2] Ingot, 99.5 percent.
[3] Electrolytic wirebar.
[4] Refined pig lead, 99.97 percent.
[5] Virgin zinc, 98 percent.
[6] Standard tin.
[7] New pence (100 pence per pound sterling) per troy ounce.

Table 29.—Nonferrous metal prices in Canada

(Average, Canadian cents per pound, unless otherwise noted)

Year and month	Aluminum [1]	Copper [2]	Lead [3]	Zinc [3]	Silver [4]
1969	28.70	50.794	15.163	14.642	192.803
1970	29.50	58.067	15.813	15.321	184.904
1971:					
January	29.50	52.625	13.500	15.000	165.880
February	29.50	51.000	13.500	15.000	161.210
March	29.50	51.261	13.500	15.000	167.952
April	29.50	53.000	13.500	15.500	173.895
May	29.50	53.000	13.500	15.750	168.130
June	29.50	53.375	13.500	16.000	164.218
July	29.50	53.750	13.500	16.190	161.419
August	29.50	53.750	13.500	17.000	160.875
September	29.50	53.750	13.500	17.000	143.971
October	29.50	53.750	13.500	17.000	134.115
November	29.50	52.983	13.500	17.000	132.336
December	29.50	50.375	13.500	17.000	139.210
Annual average	29.50	52.718	13.500	16.120	156.101

[1] Ingot 99.5 percent, f.o.b., delivered Canadian points.
[2] Electrolytic wirebar, f.o.b., delivered Canadian points.
[3] Pig lead, prime western zinc; producers' prices, carload quantities, communicated by Cominco, Ltd.
[4] Canadian cents per troy ounce, average price of Cominco, Ltd.

Source: Yearbook of the American Bureau of Metal Statistics. Fifty-first Annual Issue for the Year 1971. New York, 1972, 148 pp.

Table 30.—Mineral commodity export price indexes

(1963 = 100)

Year and quarter	Metal ores	Fuels	All crude minerals
1969	114	100	104
1970	122	105	109
1971:			
First quarter	125	120	121
Second quarter	125	128	128
Third quarter	125	131	129
Fourth quarter	127	131	130
Annual average	126	127	127

Source: United Nations. Monthly Bulletin of Statistics, New York, September 1972, p. xiii.

Table 31.—Analysis of export price indexes

(1963 = 100)

Year and quarter	Developed areas		Developing [1] areas	
	Total minerals	Nonferrous base metals	Total minerals	Nonferrous base metals
1969	107	158	103	187
1970	122	167	104	191
1971:				
First quarter	142	149	112	158
Second quarter	145	155	120	168
Third quarter	146	151	122	160
Fourth quarter	147	148	122	154
Annual average	145	151	119	160

[1] Previously titled less developed areas.

Source: United Nations. Monthly Bulletin of Statistics. New York, September 1972, p. xiii.

Table 32.—Leading world producers of bauxite

(Gross weight, thousand metric tons)

Country	1969	1970	1971 [p]
Jamaica	10,499	12,009	12,767
Australia	[r] 7,921	9,256	12,541
Surinam	5,450	• 5,340	• 5,590
U.S.S.R.• [1]	[r] 4,200	[r] 4,300	4,500
Guyana	4,306	4,144	3,817
France	2,773	2,992	3,184
Greece	[r] 1,948	2,292	3,088
Guinea	2,459	2,490	2,630
Hungary	[r] 1,934	2,022	2,090
United States	1,872	2,115	2,020
Yugoslavia	2,128	2,099	1,959
Total	[r] 45,490	49,059	54,186
All others	[r] 6,482	7,824	8,281
Grand total	[r] 51,972	56,883	62,467

• Estimate. [p] Preliminary. [r] Revised.

[1] Excludes nepheline concentrates and alunite ore.

Table 33.—Leading world producers of aluminum

(Thousand metric tons)

Country	1969	1970	1971 [p]
United States	3,441	3,607	3,561
U.S.S.R.•	1,050	1,100	1,180
Canada	[r] 979	972	1,002
Japan	569	723	893
Norway	[r] 508	530	529
Germany, West	263	309	428
France	372	381	384
Australia	126	206	223
India	[r] 132	161	178
China, People's Republic of •	120	130	140
Italy	[r] 144	147	136
Total	[r] 7,704	8,276	8,654
All others	[r] 1,262	1,385	1,615
Grand total	[r] 8,966	9,661	10,269

• Estimate. [p] Preliminary. [r] Revised.

Table 34.—Leading world producers of mine copper

(Copper content of ore, thousand metric tons)

Country	1969	1970	1971 [p]
United States [1]	1,401	1,560	1,381
Chile	699	711	718
Canada [1]	520	610	653
Zambia	[r] 719	684	651
U.S.S.R.[e] [1]	550	570	620
Zaire	357	386	407
Peru	199	220	213
Philippines	131	160	198
Australia	131	158	177
South Africa, Republic of	126	149	157
Japan	121	125	121
Total	[r] 4,954	5,333	5,296
All others	[r] 662	690	753
Grand total	[r] 5,616	6,023	6,049

[e] Estimate. [p] Preliminary. [r] Revised.
[1] Recoverable.

Table 35.—Leading world producers of iron ore, iron ore concentrates, and iron ore agglomerates

(Thousand metric tons)

Country	1969	1970	1971 [p]
U.S.S.R.	186,134	195,492	203,008
United States	89,746	91,201	82,058
Australia	[r] 38,576	51,189	62,100
France	55,425	56,805	55,862
China, People's Republic of [e]	40,000	44,000	48,000
Canada	36,337	47,459	43,976
Brazil	27,157	[e] 40,200	[e] 42,700
Sweden	33,185	31,518	34,367
India	29,564	31,366	32,288
Liberia	22,866	22,652	23,179
Venezuela	19,716	22,100	20,500
Chile	11,534	11,265	11,228
South Africa, Republic of	9,227	7,728	10,678
United Kingdom	12,298	12,018	10,229
Total	[r] 611,765	664,993	680,173
All others	[r] 100,820	102,869	98,607
Grand total	[r] 712,585	767,862	778,780

[e] Estimate. [p] Preliminary. [r] Revised.

Table 36.—Leading world producers of crude steel [1]

(Thousand metric tons)

Country	1969	1970	1971 [p]
U.S.S.R.	[r] 110,316	115,889	120,637
United States	128,151	119,308	109,264
Japan	82,166	93,322	88,557
Germany, West	45,316	45,041	40,313
United Kingdom	26,846	28,316	24,175
France	22,511	23,773	22,859
China, People's Republic of [e]	16,000	18,000	21,000
Italy	16,428	17,277	17,452
Poland	11,291	11,795	12,738
Belgium	12,832	12,607	12,443
Czechoslovakia	10,802	11,480	12,069
Canada	[r] 9,115	11,200	11,040
Spain	6,005	7,429	7,794
Romania	5,540	6,517	6,803
Australia	[r] 7,016	6,822	6,736
Total	[r] 510,335	528,776	513,880
All others	[r] 63,055	65,702	67,059
Grand total	[r] 573,390	594,478	580,939

[e] Estimate. [p] Preliminary. [r] Revised.
[1] Steel ingots and castings.

Table 37.—Leading world producers of mine lead

(Lead content of ore, thousand metric tons)

Country	1969	1970	1971[p]
United States[1]	462	519	525
U.S.S.R.[e][1]	440	440	450
Australia	[r]452	457	403
Canada	[r]302	357	393
Peru[1]	155	157	178
Mexico[1]	171	177	157
Yugoslavia	118	127	125
Bulgaria	91	96	[e]100
China, People's Republic of[e][1]	100	100	100
Total	[r]2,291	2,430	2,431
All others	[r]959	984	982
Grand total	[r]3,250	3,414	3,413

[e] Estimate. [p] Preliminary. [r] Revised.
[1] Recoverable.

Table 38.—Leading world producers of manganese ore

(Gross weight, thousand metric tons)

Country	1969	1970	1971[p]
U.S.S.R.	6,551	6,841	7,318
South Africa, Republic of	2,204	2,679	3,237
Brazil	[r]1,691	1,879	2,602
Gabon	[r]1,393	1,453	1,869
India	[r]1,486	1,651	1,779
Australia	[r]889	751	1,050
China, People's Republic of[e]	1,000	1,000	1,000
Ghana	333	391	599
Zaire	311	347	387
Japan	301	270	285
Mexico	144	274	267
Total	[r]16,303	17,536	20,393
All others	[r]821	668	609
Grand total	[r]17,124	18,204	21,002

[e] Estimate. [p] Preliminary. [r] Revised.

Table 39.—Leading world producers of mine tin

(Tin content of ore, long tons)

Country	1969	1970	1971[p]
Malaysia	72,167	72,630	74,253
Bolivia	[r]29,415	28,787	28,605
U.S.S.R.[e]	27,000	27,000	28,000
Thailand	[r]20,785	21,435	21,346
China, People's Republic of[e]	20,000	20,000	20,000
Indonesia	17,138	18,761	19,411
Australia	[r]8,177	8,689	9,639
Nigeria	8,603	7,833	7,005
Total	[r]203,285	205,135	208,259
All others	[r]22,364	23,490	23,596
Grand total	[r]225,649	228,625	231,855

[e] Estimate. [p] Preliminary. [r] Revised.

Table 40.—Leading world producers of mine zinc

(Zinc content of ore, thousand metric tons)

Country	1969	1970	1971 [p]
Canada	[r] 1,201	1,253	1,270
U.S.S.R. [e] [1]	610	610	650
United States [1]	502	485	456
Australia	[r] 510	487	450
Peru [1]	300	299	387
Japan	269	280	294
Mexico [1]	253	266	265
Poland	171	187	194
Korea, North [e] [1]	125	130	135
Germany, West	[r] 126	129	132
Zaire	[r] 95	105	120
Italy	132	111	106
Yugoslavia	97	101	100
China, People's Republic of [e] [1]	100	100	100
Total	[r] 4,491	4,543	4,659
All others	[r] 853	933	906
Grand total	[r] 5,344	5,476	5,565

[e] Estimate. [p] Preliminary. [r] Revised.

[1] Recoverable.

Table 41.—Leading world producers of hydraulic cement

(Thousand metric tons)

Country	1969	1970	1971 [p]
U.S.S.R.	[r] 89,800	95,200	100,300
United States (including Puerto Rico)	[r] 71,020	68,962	72,863
Japan	[r] 51,386	57,189	59,463
Germany, West	35,078	38,325	41,013
Italy	[r] 31,348	33,121	31,730
France	27,543	28,858	28,822
United Kingdom	17,422	17,057	17,896
Spain (including the Canary Islands)	[r] 16,013	16,536	16,993
India	13,260	13,543	14,894
Poland	11,830	12,180	13,082
China, People's Republic of [e]	10,000	10,000	10,000
Brazil	[r] 7,824	9,002	9,802
Canada	7,484	7,208	8,649
Romania	7,515	8,127	8,523
Germany, East	7,410	7,987	8,473
Czechoslovakia	6,733	7,401	7,956
Mexico	6,787	7,267	7,360
Total	[r] 418,453	437,963	457,819
All others	[r] 124,161	133,633	147,656
Grand total	[r] 542,614	571,596	605,475

[e] Estimate. [p] Preliminary. [r] Revised.

Table 42.—Leading world producers of nitrogen fertilizer compounds

(Thousand metric tons of contained nitrogen)

Country	1969 [1]	1970 [1]	1971 [1] [p]
United States (including Puerto Rico)	7,139	7,632	8,103
U.S.S.R.	4,177	4,509	5,423
Japan	[r] 2,098	2,131	2,105
Germany, West	1,598	1,574	1,505
France	[r] 1,368	1,313	[e] 1,351
China, People's Republic of [e]	940	1,040	1,200
Poland	759	938	1,030
Italy	[r] 1,088	960	966
Netherlands	954	893	930
India [e]	563	730	832
United Kingdom	841	710	748
Total	[r] 21,525	22,430	24,193
All others	[r] 7,168	8,116	8,677
Grand total	[r] 28,693	30,546	32,870

[e] Estimate. [p] Preliminary. [r] Revised.

[1] Year ending June 30 of that stated.

Table 43.—Leading world producers of phosphate rock [1]

(Thousand metric tons)

Country	1969	1970	1971 [p]
United States	[r] 34,223	35,143	35,277
U.S.S.R. [e] [2]	19,250	20,800	21,650
Morocco	10,662	11,399	12,008
Tunisia	2,685	3,016	3,162
Nauru [3]	[r] 2,193	2,114	1,867
Total	[r] 69,013	72,472	73,964
All others	[r] 11,492	11,920	12,079
Grand total	[r] 80,505	84,392	86,043

[e] Estimate. [p] Preliminary. [r] Revised.

[1] Includes output of all major crude mineral sources of phosphate.

[2] Includes material described as sedimentary rock in Soviet sources.

[3] Exports.

Table 44.—Leading world producers of marketable potash

(Thousand metric tons K_2O equivalent)

Country	1969	1970	1971 [p]
U.S.S.R.	[r] 3,183	4,087	[e] 4,807
Canada	3,168	3,103	3,513
Germany, West	2,626	2,645	2,915
Germany, East	2,346	2,419	2,426
United States	2,544	2,476	2,348
France	1,938	1,904	2,000
Total	[r] 15,805	16,634	18,009
All others	[r] 1,358	1,518	1,715
Grand total	[r] 17,163	18,152	19,724

[e] Estimate. [p] Preliminary. [r] Revised.

Table 45.—Leading world producers of pyrite

(Gross weight, thousand metric tons)

Country	1969	1970	1971 [p]
U.S.S.R. [e]	3,500	4,000	4,200
Spain	[r] 2,517	2,766	2,429
Japan	2,966	2,764	2,363
China, People's Republic of [e]	1,800	2,000	2,000
Italy	[r] 1,473	1,518	1,504
Finland	855	963	860
Romania	[e] 360	807	[e] 840
Norway	767	747	781
South Africa, Republic of	837	868	750
Cyprus	927	929	686
Sweden	495	575	592
Germany, West	640	554	554
Total	[r] 17,137	18,491	17,559
All others	[r] 3,898	3,900	3,982
Grand total	[r] 21,035	22,391	21,541

[e] Estimate. [p] Preliminary. [r] Revised.

Table 46.—Leading world producers of salt

(Thousand metric tons)

Country	1969	1970	1971 [p]
United States (including Puerto Rico)	40,167	41,665	40,012
China, People's Republic of [e]	15,000	16,000	15,000
U.S.S.R.	[r] 12,100	12,400	12,000
United Kingdom	[r] 8,726	9,188	[e] 9,257
Germany, West	[r] 8,859	10,447	8,921
India	6,380	5,588	5,790
France	[r] 4,869	5,664	5,495
Canada	4,225	4,862	5,060
Italy	3,947	4,367	4,563
Mexico	[r] 3,890	4,153	4,360
Netherlands	2,669	2,869	3,167
Australia	1,680	3,071	[e] 3,100
Poland	2,817	2,904	2,962
Romania	2,725	2,262	2,948
Germany, East	1,972	2,180	2,221
Spain	[r] 1,862	2,080	[e] 2,030
Brazil	[r] 1,630	1,823	1,477
Total	[r] 123,518	131,523	128,363
All others	[r] 13,669	14,056	14,480
Grand total	[r] 137,187	145,579	142,843

[e] Estimate. [p] Preliminary. [r] Revised.

Table 47.—Leading world producers of elemental sulfur

(Thousand metric tons)

Country	1969	1970	1971 [p]
United States	[r] 8,697	8,669	8,749
Canada	[r] 3,311	3,859	3,394
Poland	1,981	2,683	[e] 2,713
France	[r] 1,742	1,733	1,806
U.S.S.R. [e]	1,600	1,600	1,700
Mexico	1,716	1,381	1,179
Japan	348	342	408
China, People's Republic of [e]	250	250	250
Germany, West	129	176	184
Italy	124	127	122
Total	[r] 19,898	20,820	20,505
All others	[r] 707	1,073	1,132
Grand total	[r] 20,605	21,893	21,637

[e] Estimate. [p] Preliminary. [r] Revised.

Table 48.—Leading world producers of coal (all grades)

(Million metric tons)

Country	1969			1970			1971 ^p^		
	Lignite	Bituminous and anthracite	Total	Lignite	Bituminous and anthracite	Total	Lignite	Bituminous and anthracite	Total
U.S.S.R.[1]	140	467	[r] [2] 608	148	476	624	153	488	641
United States	5	513	518	5	550	[2] 556	6	503	509
China, People's Republic of [e]	(3)	330	330	(3)	360	360	(3)	390	390
Germany, East	255	1	256	261	1	262	263	1	264
Germany, West	107	[4] 112	[2] 220	108	[4] 112	220	104	[4] 111	215
Poland	31	135	166	33	140	173	35	145	180
United Kingdom	--	153	153	--	144	144	--	147	147
Czechoslovakia	79	27	106	82	28	110	84	29	113
India	4	75	[2] 80	4	74	[2] 78	4	69	73
Australia	23	46	69	24	49	73	23	49	72
South Africa, Republic of	--	53	53	--	55	55	--	59	59
France	3	41	44	3	37	40	3	33	36
Japan	(5)	45	45	(5)	40	40	(5)	33	[2] 34
Yugoslavia	26	1	27	28	1	29	30	1	31
Bulgaria	29	(5)	29	29	(5)	29	27	(5)	27
Hungary	22	4	26	24	4	28	23	4	27
Korea, North	--	25	25	--	27	27	--	30	30
Total	[6] 725	[6] 2,029	[6] 2,754	[6] 747	[6] 2,100	[6] 2,847	[6] 756	2,092	2,848
All others	36	91	[6] 126	41	93	134	43	98	141
Grand total	761	2,120	[2] 2,880	788	2,193	2,981	799	2,190	2,989

[e] Estimate. [p] Preliminary. [r] Revised.

[1] Excludes output from the U.S.S.R. controlled portion of Svalbard (Spitzbergen).

[2] Detail for separate grades (lignite and anthracite plus bituminous) does not add to listed total for all grades because of independent rounding.

[3] Output small, included under anthracite and bituminous.

[4] Includes pech coal.

[5] Less than ½ unit.

[6] Detail does not add to total because of independent rounding.

Table 49.—Leading world producers of marketed natural gas

(Billion cubic feet)

Country	1969	1970	1971 [p]
United States	20,698	21,921	22,493
U.S.S.R.	[r] 6,396	6,990	7,501
Canada	1,978	2,277	2,738
Netherlands	763	1,107	1,536
Romania	843	884	944
United Kingdom	179	392	656
Iran	98	396	551
Germany, West	[r] 307	440	535
Mexico	417	481	479
Italy	422	464	473
Venezuela	314	349	368
France	230	248	252
Argentina	188	212	229
Poland	139	183	190
Kuwait	192	204	157
Total	[r] 33,164	36,543	39,102
All others	[r] 826	1,023	841
Grand total	[r] 33,990	37,566	39,943

[p] Preliminary. [r] Revised.

Table 50.—Leading world producers of crude oil

(Million 42-gallon barrels)

Country	1969	1970	1971 [p]
United States	3,372	3,517	3,454
U.S.S.R.	2,413	2,595	2,772
Saudi Arabia	1,174	1,387	1,742
Iran	1,232	1,397	1,662
Venezuela	1,312	1,353	1,295
Kuwait	1,022	1,090	1,167
Libya	[r] 1,136	1,209	1,008
Iraq	555	570	624
Nigeria	197	396	558
Canada	411	461	493
United Arab Emirates [1]	[r] 222	284	387
Indonesia	271	312	326
Algeria	345	372	280
China, People's Republic of [e]	106	146	186
Mexico	150	157	156
Argentina	130	143	155
Qatar	130	132	157
Australia	16	65	113
Oman	120	121	107
Egypt, Arab Republic of	90	119	102
Romania	101	102	102
Total	[r] 14,505	15,928	16,846
All others	[r] 710	761	802
Grand total	[r] 15,215	16,689	17,648

[e] Estimate. [p] Preliminary. [r] Revised.

[1] Abu Dhabi and Dubai, formerly listed under Trucial States.

Table 51.—Major world trade in bauxite and alumina [1]

(Thousand metric tons)

Source country	1970 production by source country [2]	1970 export by source country [2]	Recipient country [3]											
			United States	Canada	Austria	France	West Germany	Italy	Norway	Sweden	United Kingdom	U.S.S.R.	Japan	Selected others [4]
Bauxite:														
Australia	9,256	NA	--	198	--	330	1,143	2	--	--	2	--	1,845	230
Dominican Republic	1,067	NA	1,124	--	--	--	--	--	--	--	--	--	--	--
France	2,992	159	--	--	--	XX	91	16	--	--	34	--	--	--
Ghana	350	339	--	--	--	--	43	--	--	--	273	--	--	5
Greece	2,292	1,235	59	--	--	84	158	1	4	51	76	615	15	127
Guinea	2,490	NA	15	44	--	--	--	99	--	--	--	119	--	1
Guyana	e 4,144	3,056	563	2,150	--	44	45	31	--	6	8	--	24	55
Haiti	632	646	716	--	--	--	--	--	--	--	--	--	--	--
Hungary	2,022	660	--	--	--	--	100	--	--	--	--	--	--	--
India	1,370	61	--	27	--	--	37	47	--	2	10	--	36	15
Indonesia	1,229	1,137	--	24	--	--	--	80	--	--	--	--	1,033	--
Jamaica	12,009	7,807	9,076	317	--	--	--	--	--	--	--	--	--	--
Malaysia	1,139	1,083	--	160	--	--	--	--	--	--	--	--	691	--
Sierra Leone	440	423	--	--	--	--	294	129	--	--	--	--	--	--
Surinam	e 5,340	NA	2,994	188	20	27	44	10	--	--	11	--	14	59
United States	2,115	3	XX	355	--	--	1	--	--	--	--	--	--	--
Yugoslavia	2,099	2,032	--	--	--	--	652	300	--	--	--	814	--	--
Other and not specified	5,893	NA	285	6	10	4	19	9	--	1	6	--	2	26
Total	56,879	NA	14,832	3,469	30	489	2,627	724	4	60	420	1,548	3,660	518
Alumina:														
Australia	2,152	998	1,075	165	--	--	--	--	--	--	--	--	344	--
Canada	1,105	22	164	XX	--	1	--	3	--	--	1	--	--	--
France	1,130	264	35	--	--	XX	5	21	21	--	1	--	(5)	192
Germany, West	757	172	18	--	71	4	XX	2	1	22	5	--	2	33
Greece	313	170	25	--	--	--	--	38	--	--	--	--	--	6
Guinea	610	NA	--	--	15	--	70	--	178	--	8	--	--	149
Guyana	305	329	35	81	--	--	--	--	109	30	--	--	--	30
Hungary	441	415	--	--	51	--	--	--	--	--	--	202	--	6
Jamaica	1,689	1,689	787	317	--	--	11	--	392	103	32	--	--	6
Japan	1,285	126	33	--	--	--	--	--	--	--	--	--	XX	4
Surinam	e 1,000	NA	314	30	--	--	25	--	178	13	--	--	--	187
United States	6,484	960	XX	350	13	2	10	5	134	15	4	291	2	1
Yugoslavia	125	28	--	--	29	--	--	--	--	--	--	--	--	--
Other and not specified	3,297	NA	--	--	13	--	--	3	1	1	3	25	3	39
Total	20,693	NA	2,486	943	192	7	121	72	1,014	184	54	518	351	653

[e] Estimate. NA Not available. XX Not applicable.

[1] Data presented are compiled from import statistics for countries listed as recipient countries and, as such, are incomplete, but are believed to account for the overwhelming share of total world movements of bauxite and alumina.

[2] As reported in latest country chapter of Volume III, Minerals Yearbook. Data on bauxite production is on dry equivalent basis for a number of countries, and as such may be reported on a different basis from bauxite exports, which almost universally are on a gross weight basis and which were obtained from the Statistical Office of the United Nations. Data on alumina production are generally for output prior to calcination, while data on alumina exports, also from the Statistical Office of the United Nations, include aluminum hydroxide and thus may not be exactly comparable.

[3] Countries selected are most of the world's significant aluminum producers that depend upon imports of bauxite and/or alumina for a significant share of their raw material requirements, plus a few minor countries for which data were readily available. Data are from the Statistical Office of the United Nations except for the U.S.S.R. figures which were obtained from official Soviet sources.

[4] Countries included are as follows: bauxite—Belgium, Luxembourg, Denmark, Finland, Iceland, Netherlands, Spain, Switzerland, and Yugoslavia; alumina—Australia, Belgium, Denmark, Finland, Greece, Israel, Luxembourg, Netherlands, New Zealand, Portugal, Spain, Switzerland, and Yugoslavia.

[5] Less than ½ unit.

Table 52.—Major world trade [1] in unrefined and refined unwrought copper in 1970

(Thousand metric tons)

Source country	Destination							
	Belgium-Luxembourg	Brazil	Czechoslovakia	France	Germany		Italy	Japan
					East	West		
Belgium-Luxembourg	XX	3	2	113	--	72	25	--
Canada	6	3	--	15	--	35	4	1
Chile	23	5	--	44	--	74	63	59
Germany, West	9	1	2	7	--	XX	4	--
Peru	16	--	--	1	--	18	2	8
U.S.S.R	--	--	36	--	--	1	--	--
United Kingdom	2	(2)	(2)	2	(2)	16	21	(2)
United States	12	22	--	17	--	20	35	8
Zaire [3]	265	--	--	36	--	4	43	13
Zambia	1	7	--	58	--	84	76	166
Other and unspecified [4]	10	--	(2)	23	(2)	64	10	1
Total	344	41	40	316	(2)	388	283	256

Source country	Destination							
	Netherlands	Spain	Sweden	Switzerland	United Kingdom	United States	Other and unspecified	Total
Belgium-Luxembourg	45	9	12	120	1	(2)	12	414
Canada	1	2	2	2	102	84	9	266
Chile	109	17	23	--	101	101	20	689
Germany, West	2	1	1	13	12	1	34	87
Peru	(2)	1	--	(2)	1	92	(2)	139
U.S.S.R	17	--	--	--	--	--	69	128
United Kingdom	11	7	2	1	XX	(2)	29	91
United States	19	2	2	2	23	XX	35	197
Zaire [3]	4	--	--	--	5	--	4	374
Zambia	5	11	16	9	154	1	89	677
Other and unspecified [4]	28	3	4	4	51	14	38	250
Total	241	53	62	151	450	293	339	3,257

XX Not applicable.

[1] Data are compiled from export statistics for countries listed as source countries in stub of table.

[2] Less than ½ unit.

[3] Compiled from import statistics of selected trading partners.

[4] Includes the following countries (total exports in thousand tons in parentheses following country name): Australia (39); Austria (7); Denmark (2); Finland (4); France (15); Israel (17); Italy (6); Japan (47); the Netherlands (8); New Zealand (3); Norway (35); Sweden (32); Switzerland (4); Yugoslavia (28).

Table 53.—Major world trade in iron ores, concentrates, and agglomerates (excluding roasted pyrite)[1] in 1970

(Thousand metric tons)

Source country	Recorded total 1970 export of source country [3]	Recorded imports of principal recipient country [2]						
		Canada	United States	Belgium-Luxembourg	Czechoslovakia	France	Germany, West	Hungary
Algeria	1,928	--	--	334	--	--	--	--
Angola	6,335	--	--	93	--	352	1,998	--
Australia	41,114	8	649	513	--	756	1,010	--
Brazil	27,943	146	2,023	1,653	168	2,195	6,365	--
Canada	39,348	XX	24,317	511	--	264	3,626	--
Chile	9,908	--	1,606	--	--	58	489	--
France	18,643	--	--	13,607	--	XX	5,119	--
India	20,382	--	--	306	708	36	368	133
Liberia	23,561	--	2	1,479	--	1,617	8,191	--
Malaysia	4,901	--	--	--	--	--	--	--
Mauritania	9,220	—	73	1,129	—	1,951	1,342	--
Norway	2,964	--	50	22	--	13	[4]1,524	--
Peru	9,279	--	1,351	--	--	307	220	--
Philippines	1,832	--	7	--	--	--	--	--
Sierra Leone	2,427	--	--	--	--	11	510	--
South Africa, Republic of [5]	5,527	--	--	--	--	33	587	--
Spain	2,037	--	--	81	--	455	885	--
Sweden	27,972	--	175	8,492	481	1,438	[4]11,627	--

See footnotes at end of table.

Table 53.—Major world trade in iron ores, concentrates, and agglomerates (excluding roasted pyrite)[1] in 1970—Continued

(Thousand metric tons)

Source country	Recorded total 1970 export of source country [3]	Recorded imports of principal recipient country [2]						
		Canada	United States	Belgium-Luxembourg	Czechoslovakia	France	Germany, West	Hungary
U.S.S.R.	36,100	--	--	24	10,838	--	255	2,986
United States	5,484	2,005	XX	52	--	--	8	--
Venezuela	21,089	--	13,234	808	--	104	3,010	--
Other countries and origin unreported [6]	3,174	1	2,125	65	529	45	684	--
Total	321,168	2,160	45,612	29,169	12,724	9,635	47,818	3,119

	Recorded imports of principal recipient country [2]							
	Italy	Netherlands	Poland	Romania	United Kingdom	Other Europe [7]	Japan	Total of listed imports
Algeria	394	--	532	--	62	--	--	1,322
Angola	--	--	--	--	534	280	2,164	5,421
Australia	740	173	--	--	607	320	36,577	41,353
Brazil	1,146	299	318	--	1,241	2,812	6,779	25,145
Canada	1,361	1,520	--	--	4,644	350	2,301	38,894
Chile	--	--	--	--	--	--	7,986	10,139
France	--	--	--	--	--	--	--	18,726
India	16	--	390	--	41	300	16,522	18,820
Liberia	2,817	1,581	--	--	2,078	453	2,388	20,606
Malaysia	--	--	--	--	--	--	4,906	4,906
Mauritania	1,132	46	--	--	1,731	559	715	8,678
Norway	(4)	[4] 1	154	--	[4] 845	340	--	2,949
Peru	162	--	--	--	--	--	7,753	9,793
Philippines	--	--	--	--	--	--	1,872	1,879
Sierra Leone	--	693	--	--	124	--	939	2,277
South Africa, Republic of [5]	--	40	--	--	--	--	4,818	5,478
Spain	--	--	--	--	597	34	--	2,052
Sweden	[4] 292	[4] 1,061	511	--	[4] 3,283	509	450	28,319
U.S.S.R.	913	--	9,913	[8] 4,245	1,373	3,115	1,238	34,895
United States	--	--	--	--	--	26	3,257	5,348
Venezuela	1,112	--	--	--	1,699	--	92	20,059
Other countries and origin unreported [6]	733	2	25	[9] 2,023	1,056	106	1,318	8,712
Total	10,818	5,416	11,843	6,268	19,915	9,204	102,070	315,771

XX Not applicable.

[1] Disparities between recorded exports of source countries and totals of recorded imports of recipient countries are generally due to: (1) time lag between shipment and receipt, and (2) the fact that the latter totals are incomplete, representing only the imports of the nations listed in the column heads and in footnote 7. Only in the case of India where recorded exports exceed recorded receipts by 1,562,000 tons is there an indication that there may be an error in available information.

[2] Source: Statistical Office of the United Nations. 1970 World Trade Annual. V. I, Walker and Co., New York, 1972, p. 167, except for data on Czechoslovakia, East Germany, Hungary, Poland, and Romania, which are from official trade returns of the respective countries, supplemented by export data from U.S.S.R.

[3] Source: Official trade returns of countries listed, except for Angola, Liberia, and Mauritania (data from Annales des Mines, October 1971, pp. 43–73) and Australia and India (data from Government publications of the respective countries other than official trade returns).

[4] Figures adjusted from those reported in official import statistics of West Germany, Italy, Netherlands, and the United Kingdom, to adjust for ores originating in Sweden but shipped through Narvik, Norway, and apparently credited in those sources to Norway.

[5] Includes exports from Swaziland.

[6] Recorded 1970 export total is a total of exports from the following countries (exports for each follow the country name in parentheses in thousand metric tons): Austria (1); Belgium-Luxembourg (49); Bolivia (6); Hong Kong (18); Korea, North (535-Japanese imports only); Korea, Republic of (South) (515); Morocco (801); Netherlands (92); Poland (2); Portugal (9); Thailand (52); Tunisia (584); Turkey (30); and Yugoslavia (179). Recorded imports of principle recipient countries include receipts from the foregoing list of countries as well as receipts credited to the following countries for which either: 1) no iron ore export was recorded in 1970 trade returns; or 2) trade returns for 1970 were not available: Iran, Libya, Mozambique, Nigeria, and Senegal.

[7] Includes the following countries with recorded total imports as indicated in parentheses in thousand tons: Austria (2,112); Denmark (3); Finland (748); Germany, East (2,687); Greece (553); Norway (47); Portugal (196); Spain (2,431); Sweden (135); Switzerland (29); and Yugoslavia (212).

[8] Reported U.S.S.R. exports to Romania.

[9] Figure derived by difference between total reported Romanian import and the U.S.S.R. export to Romania; origin unreported.

Table 54.—Major world trade in steel ingots and semimanufactures in 1970, by area

(Thousand metric tons)

Exporting country and area	Destination [1]						
	North America			Europe			
	Canada	United States	Latin America [2]	European Economic Community	European Free Trade Association	Other non-Communist	Communist [3]
North America:							
Canada	XX	1,052.4	96.3	71.8	65.4	49.6	30.1
United States	682.1	XX	1,068.9	1.941.8	1,076.1	441.6	56.1
Total	682.1	1,052.4	1,165.2	2,013.6	1,141.5	491.2	86.2
Europe:							
European Economic Community:							
Belgium-Luxembourg	43.0	1,022.0	252.0	8,688.0	1,078.0	386.0	98.0
France	55.6	961.2	220.9	3,556.3	978.9	275.5	340.7
Germany, West	81.2	1,569.3	308.9	5,377.5	2,018.9	493.7	1,258.1
Italy	2.3	151.0	73.3	629.2	246.5	76.8	189.5
Netherlands	--	423.0	44.0	1,757.0	616.0	127.0	47.0
Subtotal	182.1	4,126.5	899.1	20,008.0	4,938.3	1,359.0	1,933.3
European Free Trade Association:							
Austria	10.3	9.9	17.8	711.1	272.4	38.3	257.4
Denmark	--	--	.3	113.1	142.3	8.3	.9
Norway	.1	.2	3.8	153.9	270.1	34.5	1.3
Portugal	--	--	--	2.5	3.4	3.5	--
Sweden	15.0	68.0	24.0	426.0	584.0	14.7	93.0
Switzerland [6]	.9	9.5	.5	53.1	29.8	4.6	.2
United Kingdom	133.0	742.7	258.8	497.9	691.6	606.2	123.2
Subtotal	159.3	830.3	305.2	1,957.6	1,993.6	710.1	476.0
Other non-Communist Europe:							
Finland	--	3.6	.7	221.5	176.7	--	--
Greece	--	2.1	--	10.9	5.2	2.2	141.4
Spain	--	55.1	20.5	122.6	19.9	12.2	5.2
Subtotal	--	60.8	21.2	355.0	201.8	14.4	146.6
European Communist Countries:							
Bulgaria	--	--	3.5	146.3	43.2	58.9	300.7
Czechoslovakia	82.7	24.9	7.6	548.4	273.2	68.6	1,230.5
Germany, East [7]	--	--	--	18.5	20.7	25.4	17.8
Hungary	--	--	--	257.3	197.7	51.5	216.2
Poland	5.0	71.4	182.6	120.1	131.6	28.8	796.9
Romania	--	--	4.9	440.2	43.7	14.0	596.4
U.S.S.R.	--	--	173.0	89.3	46.4	122.3	5.835.5
Yugoslavia	--	--	--	108.1	9.9	13.7	138.7
Subtotal	87.7	96.3	371.6	1,728.2	766.4	383.2	9,132.7
Total	429.1	5,113.9	1,597.1	24,048.8	7,900.1	2,466.7	11,688.6
Africa: South Africa, Republic of	.9	62.9	.2	27.6	14.3	27.2	--
South Asia and Far East:							
India [8]	.1	37.2	9.2	3.1	12.5	.7	216.0
Japan	344.0	5,580.0	1,573.0	950.0	345.0	737.0	712.0
Subtotal	344.1	5,617.2	1,582.2	953.1	357.5	737.7	928.0
Oceania: Australia	20.0	81.0	18.0	31.0	69.0	59.0	28.0
Grand total	1,476.2	11,927.4	4,362.7	27,074.1	9,482.4	3,781.8	12,730.8

See footnotes at end of table.

Table 54.—Major world trade in steel ingots and semimanufactures in 1970, by area—Continued

(Thousand metric tons)

Exporting country and area	Destination [1]							
			South Asia and Far East					
	Africa	Near East [4]	Japan	Other non-Communist	Communist [5]	Oceania	Unallocated	Total
North America:								
Canada	9.1	21.9	0.2	17.9	--	21.6	--	1,436.3
United States	192.3	109.9	15.1	805.4	--	33.5	--	6,422.8
Total	201.4	131.8	15.3	823.3	--	55.1	--	7,859.1
Europe:								
European Economic Community:								
Belgium-Luxembourg	460.0	329.0	2.0	102.0	56.0	18.0	--	12,534.0
France	644.8	231.0	--	52.0	19.1	40.3	--	7,376.3
Germany, West	285.9	199.5	3.2	152.6	279.9	15.2	--	12,043.9
Italy	144.5	178.8	.1	31.4	16.0	3.4	7.9	1,750.7
Netherlands	81.0	19.0	--	20.0	2.0	2.0	6.0	3,144.0
Subtotal	1,616.2	957.3	5.3	358.0	373.0	78.9	13.9	36,848.9
European Free Trade Association:								
Austria	6.4	54.5	.3	3.4	3.7	2.2	5.4	1,393.1
Denmark	.6	.7	--	.7	--	--	--	266.9
Norway	1.4	2.7	.2	1.8	--	--	--	470.0
Portugal	29.1	1.4	--	.5	--	--	--	40.4
Sweden	14.0	6.0	4.0	12.0	34.0	10.0	--	1,304.7
Switzerland [6]	1.0	.6	--	.1	--	--	1.5	101.8
United Kingdom	286.7	200.8	.6	433.3	46.0	129.5	--	4,150.3
Subtotal	339.2	266.7	5.1	451.8	83.7	141.7	6.9	7.727.2
Other non-Communist Europe:								
Finland	--	4.5	--	4.3	2.9	--	--	414.2
Greece	1.7	15.7	--	--	--	.7	.1	180.0
Spain	13.9	2.5	--	--	--	--	.5	252.4
Subtotal	15.6	22.7	--	4.3	2.9	.7	.6	846.6
European Communist Countries:								
Bulgaria	15.1	51.0	16.3	15.5	3.0	--	--	653.5
Czechoslovakia	28.3	272.3	--	16.4	38.4	--	--	2,591.3
Germany, East [7]	--	--	--	--	--	--	--	82.4
Hungary	33.3	115.7	--	31.8	3.6	--	--	907.1
Poland	29.9	61.9	--	26.9	37.3	--	--	1,492.4
Romania	.3	159.5	--	1.0	110.9	--	--	1,370.9
U.S.S.R.	54.9	487.3	--	120.2	70.7	--	476.6	7,476.2
Yugoslavia	3.0	17.1	--	1.4	22.0	--	--	313.9
Subtotal	164.8	1,164.8	16.3	213.2	285.9	--	476.6	14,887.7
Total	2,135.8	2,411.5	26.7	1,027.3	745.5	221.3	498.0	60,310.4
Africa: South Africa, Republic of	--	--	3.6	12.2	--	5.0	238.0	391.9
South Asia and Far East:								
India [8]	24.7	194.8	37.4	87.5	--	.1	--	623.3
Japan	793.0	645.0	XX	3,734.0	1,580.0	597.0	--	17.590.0
Subtotal	817.7	839.8	37.4	3,821.5	1,580.0	597.1	--	18,213.3
Oceania: Australia	11.0	11.0	11.0	501.0	1.0	241.0	16.0	1,098.0
Grand total	3,165.9	3,394.1	94.0	6,185.3	2,326.5	1,119.5	752.0	87,872.7

XX Not applicable.

[1] Because some countries do not report destinations for a portion of exports (see unallocated column), figures given for distribution of those countries' exports by continental area are not exactly correct. However, such unallocated quantities are sizable only in the case of the U.S.S.R. and the Republic of South Africa.

[2] All Western Hemisphere areas except the United States and Canada.

[3] Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Romania, U.S.S.R., and Yugoslavia.

[4] Bahrain, Cyprus, Iran, Iraq, Jordan, Kuwait, Lebanon, Muscat and Oman, Qatar, Saudi Arabia, Southern Yemen (formerly Aden), Syria, United Arab Emirates, Turkey, and Yemen.

[5] Consist of People's Republic of China, North Korea, and North Vietnam; Mongolia is included under other non-Communist Asia and Far East, owing to its inseparability from this group in source.

[6] Source: Statistical Office of the United Nations. 1970 World Trade Annual. V. III, Walker and Co., New York, 1972, 528 pp.

[7] Partial figure; derived from import data of partner countries. Source: Statistical Office of the United Nations. 1970 Supplement to the World Trade Annual. V. I, Walker and Co., New York, 1971, p. 175.

[8] Year beginning April 1, 1970 and ending March 31, 1971.

Source: Except where otherwise noted: United Nations Economic Commission for Europe. Statistics of World Trade in Steel, 1970, 61 pp.

Table 55.—World trade of lead ores and concentrates [1]

(Thousand metric tons of contained metal unless otherwise specified)

Destination	Exporting region								
	North America	Latin America [2]	Western Europe [3]	Eastern Europe [4]	Africa	Asia	Oceania	Origin not reported by continent	Total
1970									
United States	37.3	37.9	--	--	(5)	--	26.6	--	101.8
Western Europe:									
Belgium-Luxembourg [6]	--	32.5	41.0	--	--	--	--	37.3	110.8
France [7]	--	4.8	35.0	--	30.8	--	6.9	--	77.5
Germany, West	41.6	28.9	63.2	8.7	11.0	1.2	5.7	--	160.3
United Kingdom	2.6	14.6	4.7	--	4.4	--	9.2	--	35.5
Other [8]	9.4	--	12.2	--	5.8	--	--	2.1	29.5
Total	53.6	80.8	156.1	8.7	52.0	1.2	21.8	39.4	413.6
Japan	78.8	21.5	--	--	1.1	17.1	16.8	1.3	136.6
Grand total	169.7	140.2	156.1	8.7	53.1	18.3	65.2	40.7	652.0
1971									
United States	20.3	31.5	--	--	--	--	8.1	--	59.9
Western Europe:									
Belgium-Luxembourg [7]	34.5	24.6	13.5	--	--	--	--	13.2	85.8
France	3.0	6.9	41.7	--	38.4	.5	14.3	--	104.8
Germany, West	42.1	36.0	39.5	.1	8.8	.3	--	--	126.8
United Kingdom	2.3	6.2	6.2	--	9.8	--	18.4	--	42.9
Other [9]	6.2	--	15.1	--	--	--	--	.2	21.5
Total	88.1	73.7	116.0	.1	57.0	.8	32.7	13.4	381.8
Japan	93.8	14.2	--	--	.7	17.4	12.4	1.3	139.8
Grand total	202.2	119.4	116.0	.1	57.7	18.2	53.2	14.7	581.5

[1] Imports of countries other than those listed believed small.
[2] Includes Mexico.
[3] Includes Yugoslavia.
[4] Includes Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Romania, and U.S.S.R.
[5] Less than 50 tons.
[6] Gross weight of ore January through September.
[7] January through October.
[8] Includes Italy gross weight of ore, January through September and Austria for January through September.
[9] Includes Italy gross weight of ore, January through October and Austria for January through June.

Source: Monthly Bulletin of Statistics of the International Lead and Zinc Study Group. Lead and Zinc Statistics, April 1971, v. 11, No. 4, p. 24; April 1972, v. 12, No. 4, p. 24.

Table 56.—Major world trade in lead bullion and refined lead [1]

(Thousand metric tons)

Destination	Exporting region								
	North America	Latin America [2]	Western Europe [3]	Eastern Europe [4]	Africa	Asia	Oceania	Origin not reported by continent	Total [5]
1970									
United States	57.9	82.6	22.1	--	11.9	--	46.9	0.7	222.1
Western Europe:									
Belgium-Luxembourg [6]	.3	1.4	9.4	--	--	--	--	1.6	12.7
France	--	.5	24.0	0.6	22.6	--	--	--	47.7
Germany, West	4.3	2.2	80.6	.7	.6	17.3	16.5	.4	122.6
Italy	.2	24.5	36.6	9.1	33.4	--	--	16.8	120.6
Netherlands	.1	9.2	27.4	1.9	.8	.3	10.5	1.0	51.2
Switzerland	3.4	2.3	18.7	.1	.3	--	1.2	--	26.0
United Kingdom	41.2	--	.3	--	7.7	--	206.0	.2	255.4
Other [7]	.7	4.6	35.7	7.8	6.4	--	--	.2	55.4
Total	50.2	44.7	232.7	20.2	71.8	17.6	234.2	20.2	691.6
Japan	.2	--	--	--	.2	.6	--	.6	1.6
Grand total	108.3	127.3	254.8	20.2	83.9	18.2	281.1	21.5	915.3
1971									
United States	51.5	59.9	11.9	--	12.3	--	41.9	--	177.5
Western Europe:									
Belgium-Luxembourg [8]	--	--	17.0	--	--	--	--	2.3	19.3
France	.1	--	24.9	1.1	15.5	--	--	--	41.6
Germany, West	2.8	1.9	92.5	.4	1.6	4.6	19.6	--	123.4
Italy [9]	--	26.4	40.6	--	22.3	7.8	--	15.5	112.6
Netherlands	--	6.4	25.2	2.2	--	--	23.2	--	57.0
Switzerland	2.0	3.9	14.9	.4	.3	--	1.2	.3	23.0
United Kingdom	42.6	.2	--	--	9.6	--	177.8	--	230.2
Other [10]	1.2	5.1	27.7	7.0	5.1	--	--	--	46.1
Total	48.7	43.9	242.8	11.1	54.4	12.4	221.8	18.1	653.2
Japan	.5	.6	--	--	.9	1.5	--	.1	3.6
Grand total	100.7	104.4	254.7	11.1	67.6	13.9	263.7	18.2	834.3

[1] Imports of countries other than those listed are generally small individually (except for Eastern European nations listed in footnote 4) but in aggregate apparently total about 125,000 tons per year. Total lead imports by East European countries including trade between the countries of this group, apparently totals 70,000 tons or more per year.

[2] Includes Mexico.

[3] Includes Yugoslavia.

[4] Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Romania, and U.S.S.R.

[5] Reported totals.

[6] January through September.

[7] Includes Austria, January through September; Norway, January through November; and Denmark, Finland, Ireland, and Sweden, January through December.

[8] January through November.

[9] January through June.

[10] Includes Austria, January through June; and Norway, Denmark, Finland, Ireland, and Sweden, January through December.

Source: Monthly Bulletin of International Lead and Zinc Statistics, May 1971, v. 11, No. 5, pp. 24–25; May 1972, v. 12, No. 5, pp. 24–25.

Table 57.—World trade of zinc ores and concentrates [1]

(Thousand metric tons of contained metal unless otherwise specified)

Destination	Exporting region								
	North America	Latin America [2]	Western Europe [3]	Eastern Europe [4]	Africa	Asia	Oceania	Origin not reported by continent	Total
1970									
United States	288.5	181.8	--	--	4.6	--	2.1	(5)	477.0
Western Europe:									
Belgium-Luxembourg [6]	290.8	--	19.3	--	33.9	--	--	98.6	442.6
France [7]	52.8	41.6	80.5	--	16.1	0.8	--	--	191.8
Germany, West	94.3	8.3	54.0	4.8	5.3	3.7	6.8	--	177.2
United Kingdom	26.2	6.4	12.5	--	--	--	103.3	5.9	154.3
Other [8]	33.4	.3	69.7	--	1.7	--	14.8	--	119.9
Total	497.5	56.6	236.0	4.8	57.0	4.5	124.9	104.5	1,085.8
Japan	126.4	164.5	.5	--	2.0	73.5	87.9	2.3	457.1
Grand total	912.4	402.9	236.5	4.8	63.6	78.0	214.9	106.8	2,019.9
1971									
United States	189.8	114.7	3.6	--	.1	--	2.6	--	310.8
Western Europe:									
Belgium-Luxembourg [7]	265.8	--	39.7	--	39.6	--	--	85.9	431.0
France	79.6	48.0	71.6	--	20.4	3.7	--	--	223.3
Germany, West	95.4	12.5	46.3	4.7	1.0	6.2	7.4	--	173.5
United Kingdom	23.7	9.8	12.2	--	--	--	87.0	3.3	136.0
Other [9]	36.1	5.9	41.3	--	.6	1.0	10.3	--	95.2
Total	500.6	76.2	211.1	4.7	61.6	10.9	104.7	89.2	1,059.0
Japan	155.6	222.9	--	--	1.2	34.7	62.9	--	477.3
Grand total	846.0	413.8	214.7	4.7	62.9	45.6	170.2	89.2	1,847.1

[1] Imports of countries other than those listed believed small.
[2] Includes Mexico.
[3] Includes Yugoslavia.
[4] Includes Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Romania, and U.S.S.R.
[5] Less than 50 tons.
[6] Data are for gross weight of ore, January through September.
[7] January through October.
[8] Includes Austria, January through September; Norway, January through November; and the Netherlands, January through December.
[9] Includes Austria, January through June; Norway and the Netherlands, January through December.

Source: Monthly Bulletin of the International Lead and Zinc Study Group, Lead and Zinc Statistics, April 1971, v. 11, No. 4, p. 24; and April 1972, v. 11, No. 4, p. 25.

Table 58.—Major world trade in refined zinc

(Thousand metric tons)

Destination	Exporting region								
	North America	Latin America[1]	Western Europe[2]	Eastern Europe[3]	Africa	Asia	Oceania	Origin not reported by continent	Total[4]
1970									
United States	109.4	35.7	27.1	7.0	9.2	--	27.5	29.6	245.5
Western Europe:									
Belgium-Luxembourg[5]	1.7	--	1.7	--	9.6	1.9	4.2	3.8	22.9
France	4.3	--	14.7	5.1	1.8	--	--	--	25.9
Germany, West	10.1	7.1	110.8	7.3	8.5	.9	1.1	--	145.8
Italy	6.0	--	23.5	4.6	6.3	--	.9	2.7	44.0
Netherlands	--	.1	5.1	5.7	--	3.1	.1	--	14.1
Sweden	--	--	23.6	5.1	--	5.3	--	--	34.0
Switzerland	.5	.1	20.7	1.7	2.4	1.4	.5	(6)	27.3
United Kingdom	101.0	5.3	15.6	17.0	.3	2.3	18.5	.7	160.7
Other[7]	.4	.2	16.0	5.0	2.1	--	--	.5	24.2
Total	124.0	12.8	231.7	51.5	31.0	14.9	25.3	7.7	498.9
Hong Kong	2.9	--	.3	--	--	.3	3.1	1.3	7.9
Japan	7.9	1.5	--	.6	.8	6.8	4.8	--	21.6
Grand total	244.2	50.0	259.1	59.1	41.0	22.0	60.7	38.6	773.9
1971									
United States	136.9	30.9	62.2	3.5	12.7	7.9	35.0	.8	289.9
Western Europe:									
Belgium-Luxembourg[8]	3.9	--	4.1	--	8.5	5.4	3.3	6.4	31.5
France	1.2	--	14.5	5.3	1.2	7.1	.2	--	29.5
Germany, West	8.9	.8	127.8	10.6	12.1	1.9	--	--	162.1
Italy[8]	2.8	.2	23.6	5.7	1.9	--	--	3.1	37.3
Netherlands	--	.5	8.4	4.3	--	6.3	--	--	19.5
Sweden	1.5	--	26.6	6.1	--	--	--	--	34.2
Switzerland	.1	.1	20.2	.9	1.6	3.2	--	--	25.9
United Kingdom	73.7	1.9	22.3	39.5	1.2	--	31.8	.1	171.7
Other[9]	.2	--	11.4	2.5	1.1	--	--	--	15.2
Total	92.3	3.5	258.9	74.9	27.6	23.9	35.3	9.6	526.9
Hong Kong	2.3	--	.5	--	--	2.0	2.7	1.0	8.5
Japan	2.4	.5	--	--	--	8.6	1.8	--	13.3
Grand total	233.9	34.9	321.6	78.4	40.3	42.4	74.8	11.4	838.6

[1] Includes Mexico.

[2] Includes Yugoslavia.

[3] Includes Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Romania, and U.S.S.R.

[4] Reported totals; detail may not add horizontally owing to rounding.

[5] January through September.

[6] Less than 50 tons.

[7] Includes Austria, January through September; and Denmark, Finland, and Ireland, January through December.

[8] January through November.

[9] Includes Austria, January through June; and Denmark, Finland, and Ireland, January through December.

Source: Monthly Bulletin of the International Lead and Zinc Study Group, Lead and Zinc Statistics. May 1971, v. 11, No. 5, pp. 26–27, May 1972, v. 12, No. 5, pp. 26–27.

Table 59.—World movement of solid fuels in 1970 [1]

(Thousand metric tons, standard coal equivalent)

Source area	Destination					
	North America [2]	Caribbean America [3]	Other America [4]	Western Europe [5]	Africa	Near East
North America [2]	17,915	720	2,800	19,950	--	--
Western Europe [5]	65	20	100	36,850	440	20
Africa	--	--	--	1,000	1,370	--
Far East	--	--	--	50	40	--
Oceania	--	--	180	1,340	--	--
Other countries [6]	—	85	220	27,770	650	--
Total [7]	17,980	830	3,300	[8] 81,170	2,530	20

Source area	Destination				
	Far East	Oceania	Other countries [6]	Destination unspecified [9]	World [7]
North America [2]	29,050	20	895	10	71,400
Western Europe [5]	40	--	1,200	110	38,840
Africa	375	10	--	260	3,020
Far East	860	--	--	5	970
Oceania	16,770	410	20	--	18,730
Other countries [6]	4,910	--	36,130	170	69,920
Total [7]	52,020	450	38,295	590	203,180

[1] Data based on the general trade system; lignite briquets are reduced to standard coal equivalent (SCE) before inclusion; bunker loadings are excluded.

[2] Bermuda, Canada, Greenland, St. Pierre, and the United States.

[3] Mexico, all areas of Central America, all Islands of the Caribbean, Colombia, and Venezuela.

[4] All South America except Colombia and Venezuela.

[5] All non-Communist nations of Europe and Yugoslavia.

[6] Chiefly the Communist nations of Europe and Asia, but apparently including some other countries not identified separately.

[7] Reported totals; detail does not add to listed total as shown because of: (1) inclusion of quantities shipped to or received from areas not listed separately or not identified in original sources and (2) rounding.

[8] Column adds to 86,960 thousand metric tons, SCE, considerably in excess of the total officially reported. Reason for the discrepancy is not known.

[9] As reported in source.

Source: Statistical Office of the United Nations. World Energy Supplies 1961–70. Series J, No. 15, New York, 1972, pp. 80–85.

Table 60.—World movement of crude petroleum in 1960–70 [1]

(Thousand metric tons)

Source area [2]	Destination: North America	Caribbean America	Other America	Western Europe	Africa	Near East
1969						
North America	26,670	30	--	60	--	--
Caribbean America	37,400	66,390	7,090	24,650	250	--
Other America	920	90	550	170	--	--
Western Europe	70	--	--	1,250	--	--
Africa	13,230	7,930	3,670	202,070	2,940	680
Near East	15,830	3,110	10,510	274,410	14,050	22,660
Far East	4,460	300	--	130	--	--
Other countries	--	4,300	180	23,960	1,960	--
Total [3]	98,580	82,150	22,000	527,120	19,200	23,340
1970						
North America	32,590	570	--	30	--	--
Caribbean America	35,300	71,440	5,700	22,080	180	--
Other America	--	130	520	150	--	--
Western Europe	160	--	--	1,440	30	--
Africa	8,470	15,730	5,280	242,890	3,060	530
Near East	16,320	4,160	10,560	310,190	15,830	22,820
Far East	3,580	950	--	--	--	--
Other countries	--	4,500	--	25,820	2,070	--
Total [3]	96,420	97,480	22,060	602,600	21,170	23,350

Source area [2]	Destination: Far East	Oceania	Other countries	Destination unspecified	World [3]
1969					
North America	100	--	--	--	26,860
Caribbean America	500	--	--	--	136,280
Other America	20	--	--	--	1,750
Western Europe	--	--	--	--	1,320
Africa	1,110	350	3,360	--	285,790
Near East	175,420	15,800	1,090	8,690	541,570
Far East	24,630	5,700	--	--	35,220
Other countries	550	--	32,640	540	64,130
Total [3]	202,330	21,850	37,090	9,230	1,042,920
1970					
North America	30	--	--	--	33,220
Caribbean America	600	--	--	--	135,300
Other America	--	--	--	--	800
Western Europe	--	--	--	--	1,630
Africa	2,430	--	4,370	--	282,760
Near East	198,360	13,670	2,080	13,750	607,740
Far East	33,840	3,350	--	--	41,720
Other countries	500	--	34,440	--	67,330
Total [3]	235,760	17,020	40,890	13,750	1,170,500

[1] Data are based on the general trade system.

[2] For details on countries included in each area see footnotes to table 59.

[3] Reported totals; detail may not add to totals shown because of: (1) inclusion in totals of quantities shipped to or received from areas not listed separately or not identified in original sources and (2) rounding.

Source: Statistical Office of the United Nations. World Energy Supplies 1961–70. Series J, No. 15, New York, 1972, pp. 114–121.

Table 61.—Refined petroleum fuel trade, by continental area [1]

(Million metric tons)

Continental area [2]	Exports		Imports		Bunkers	
	1969	1970	1969	1970	1969	1970
North America	6.93	7.91	96.35	112.72	18.49	17.81
Caribbean America	118.16	133.09	13.80	13.57	13.30	14.23
Other America	.27	1.10	4.71	4.59	1.50	1.60
Western Europe	89.27	102.01	106.55	121.11	45.96	46.24
Eastern Europe	36.03	37.43	7.40	7.62	NA	NA
Africa	4.53	4.29	13.27	13.68	7.50	8.11
Near East	55.47	65.24	3.72	2.58	17.49	20.11
Far East	19.79	20.33	42.31	50.36	23.68	25.06
Oceania	.86	1.35	4.41	4.80	3.69	3.59
Not specified [3]	.14	.13	1.51	1.42	.64	.78
Total	331.45	372.88	294.03	332.45	132.25	137.53

NA Not available.

[1] Figures given are for fuel commodities only, excluding lubricants and other refinery products not normally used as energy sources. Apparent discrepancies between export, import, and bunker totals evidently result from quantities of material en route at yearend, from incomplete data, and from differing practices from country to country in the method of reporting bunkering materials.

[2] Continental areas are the same as those used in table 59 except that Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Romania, and the U.S.S.R. are reported under the group term Eastern Europe.

[3] Derived figure; difference between listed detail and reported total.

Source: Statistical Office of the United Nations. World Energy Supplies 1961–70. Series J, No. 15, New York, 1972, pp. 122–148.

The Mineral Industry of Algeria

By Roman V. Sondermayer [1]

Natural gas and crude oil remained the principal minerals produced in Algeria during 1971, and the combined export value of both commodities accounted for 60 percent of country's total value of exports. The output of iron ore, lead, mercury, copper, pyrites, phosphate rock, cement, clays, marble, and salt was of domestic significance only.

Nationalization of French oil interests, long-term arrangements for the sale of liquefied natural gas (LNG) to the United States, expansion of existing and construction of new LNG facilities, and commissioning of a new mercury smelter near Azzaba were the focal points of mineral industry development in Algeria.

During 1971 Algeria's Government partially nationalized French oil companies and after bitter negotiations concluded agreements for compensation of the nationalized part of French interests and for new prices for Algerian crude oil. New compensation agreements gave the Algeria's state-owned company Société Nationale pour la Recherche la Production, le Transport, la Transformation et la Commercialisation des Hydrocarbures (Sonatrach) 51 percent of French oil interests, making Sonatrach the largest crude oil producer in Algeria.

Having large reserves of natural gas and experience in selling LNG to France and the United Kingdom, Algerian authorities have concluded long-term agreements with El Paso Natural Gas Co., El Paso, Tex., and Distrigas Corp., Boston, Mass., for the delivery of LNG to the United States. At yearend these projects were awaiting approval by the (U.S.) Federal Power Commission. Construction of four gas liquefying lines at Skidka continued during 1971, and a contract for construction of a large new LNG plant at Arzew was awarded to the United Kingdom subsidiary of Chemical Construction Corp. (Chemico), a U.S. firm. The U.S.S.R. continued to maintain its presence in the minerals industry of Algeria. A 7-year contract was signed between Technoexport of the U.S.S.R. and Algerian authorities for a joint mining research program involving 360 Soviets and about 1,000 Algerians.

PRODUCTION

According to preliminary data, there were no pronounced changes in the 1971 mineral production of Algeria, except for a 49 percent barite decline and a 22.8-percent decline in crude oil production. The dispute with France and the ensuing French boycott of Algerian oil and natural gas contributed to the decrease. Table 1 shows principal minerals produced in the country in 1971 and 2 previous years.

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[1] Petroleum engineer, Division of Fossil Fuels.

Table 1.—Algeria: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1969	1970	1971 [p]
METALS			
Antimony concentrate:			
Gross weight [e]	[r] 142	[r] 150	150
Metal content [e]	[r] 57	[r] 60	60
Copper concentrate:			
Gross weight	2,363	2,406	2,167
Metal content	550	574	514
Iron and steel:			
Iron ore, thousand tons	2,969	2,863	3,147
Pig iron [e], do.	60	70	70
Crude steel, do.	18	[e] [r] 18	[e] 18
Semimanufactures [e], do.	50	50	50
Lead concentrate:			
Gross weight	11,460	7,440	7,216
Metal content	7,947	6,523	4,669
Mercury, 76-pound flasks	--	--	7,136
Silver [e], thousand troy ounces	100	[r] 65	65
Zinc concentrate:			
Gross weight	40,769	30,556	30,097
Metal content	20,887	16,974	15,797
NONMETALS			
Barite:			
Crude	41,057	73,397	27,700
Powder	51,710	51,643	[e] 36,500
Cement, hydraulic, thousand tons	950	924	[e] 1,000
Clays, bentonitic	12,580	NA	NA
Diatomite	10,545	--	--
Fertilizer materials:			
Phosphate rock, thousand tons	420	492	491
Superphosphate, do.	[e] 120	NA	NA
Gypsum [e], do.	175	175	175
Lime [e], do.	20	20	20
Pyrite:			
Gross weight	41,759	32,504	27,422
Sulfur content	19,209	14,952	12,614
Salt, thousand tons	150	74	[e] 100
Sulfur, elemental [e]	22,000	22,000	22,000
MINERAL FUELS AND RELATED MATERIALS			
Coal, thousand tons	19	13	[e] 14
Gas, natural:			
Gross production, million cubic feet	350,000	[e] 340,000	[e] 350,000
Marketable (including liquefied), do.	105,520	102,377	104,699
Natural gas liquids (condensate), thousand 42-gallon barrels	7,905	NA	NA
Petroleum:			
Crude, do.	345,436	371,767	279,627
Refinery products:			
Gasoline, do.	4,313	4,372	4,845
Jet fuel and kerosine, do.	1,620	1,579	1,814
Distillate fuel oil, do.	5,877	6,948	6,938
Residual fuel oil, do.	2,943	3,330	3,963
Lubricants, do.	1	--	--
Other, do.	1,243	1,250	1,809
Refinery fuel and losses, do.	342	907	[e] 968
Total, do.	16,339	18,386	[e] 20,337

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, secondary aluminum and secondary lead may be produced in small quantities, and a variety of crude construction materials (common clay, sand and gravel, and stone) undoubtedly are produced, but output is not reported and available information is inadequate to make reliable estimates of output levels.

TRADE

Tables 2 and 3 indicate foreign trade in minerals for 1969 and 1970 the latest years for which information was available.

Table 2.—Algeria: Exports of selected mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum, including alloys, all forms	691	336	All to France.
Copper:			
Ore and concentrate [2]	2,116	1,206	All to Japan.
Metal, including alloys, all forms	--	1,004	France 959; West Germany 30; Italy 15.
Iron and steel:			
Iron ore and concentrate [2] thousand tons	2,765	1,928	Italy 394; Belgium-Luxembourg 334; United Kingdom 62 (1,138 not accounted for).
Scrap	12,238	13,985	Italy 4,950; France 4,685; Spain 4,350.
Pig iron and cast iron	65,564	323,043	Italy 201,839; Japan 55,865; Spain 30,813.
Lead:			
Ore and concentrate [2]	10,060	10,915	Morocco 3,908; West Germany 2,080; France 1,785.
Metal, including alloys, all forms	643	988	France 850; Italy 138.
Nickel scrap	--	38	All to West Germany.
Silver, argentiferous metallurgical residues value, thousands	$126	$108	All to France.
Zinc:			
Ore and concentrate [2]	44,283	35,610	Spain 9,092; France 6,976; Italy 6,787.
Metal, including alloys, all forms	260	142	All to France.
Other, ores and concentrates, n.e.s	1,329	--	
NONMETALS			
Barite	5,286	--	
Clays, crude n.e.s	1,384	1,483	All to United Kingdom.
Diatomite and other siliceous earths	4,365	2,527	Italy 1,849; United Kingdom 678.
Feldspar, fluorspar, n.e.s	--	17,439	All to Italy.
Fertilizer materials, crude, phosphate rock	92,898	148,494	France 81,792; Yugoslavia 16,846; West Germany 15,369; Spain 14,961; Italy 11,103.
Salt	27,090	23,500	All to France.
MINERAL FUELS AND RELATED MATERIALS			
Gas, natural, liquefied million cubic feet	60,068	58,000	United Kingdom 34,000; France 21,000; United States 3,000.
Petroleum: [3]			
Crude thousand 42-gallon barrels	327,015	315,625	France 206,357; West Germany 61,165; Italy 11,300.
Refinery products: [4]			
Gasoline do	1,178	985	NA.
Kerosine and jet fuel do	294	268	NA.
Distillate fuel oil do	765	1,219	NA.
Residual fuel oil do	1,206	1,952	NA.
Other do	42	312	NA.
Total do	3,485	4,736	

NA Not available.

[1] Except where otherwise noted, compiled from import data of the following countries: Australia, Austria, Belgium-Luxembourg, Canada, Denmark, Finland, France, West Germany, Greece, Iceland, Ireland, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the U.S.S.R., the United Kingdom, the United States, and Yugoslavia.

[2] Source: Bureau de Documentation Minière (of France). Annales des Mines, September 1970, pp. 65–66, and October 1971, p. 48.

[3] Source: U.S. Bureau of Mines, International Petroleum Annual, 1969 and 1970.

[4] Excludes bunkers.

Source: Except where otherwise noted, Statistical Office of the United Nations. 1969 Supplement to the World Trade Annual. V. 3 (Africa), Walker and Co., New York, 1971, pp. 536–539. 1970 Supplement to the World Trade Annual. V. 3 (Africa), Walker and Co., New York, 1972, pp. 150–154.

COMMODITY REVIEW

METALS

Algeria's production of metals remained modest by world standards during 1971. Although Algeria produced iron, copper, lead and zinc ores and concentrates, mercury, and other metals, only iron ore and mercury were to a certain extent significant.

In the fall of 1970, Aero Service Corp., a division of Litton Industries, concluded a contract of $6 million [2] with Société Nationale de Recherche et d'Exploitation Minière (Sonarem) for an aerial magnometric mineral survey of the country. The survey, which began in February 1971 in the southeastern desert, will be completed in 39 months and will cover the entire

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[2] Where necessary, values have been converted from Algerian Dinars (AD) to U.S. dollars at the rate of AD 4.937=US$1.00.

Table 3.—Algeria: Apparent imports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum metal, including alloys, all forms	3,495	4,725	France 1,923; Canada 799; Spain 554.
Copper, including alloys, all forms	2,877	2,687	France 1,364; Belgium-Luxembourg 762; West Germany 429.
Iron and steel:			
Pig iron and ferroalloys	538	1,835	Belgium-Luxembourg 730; West Germany 560; France 545.
Steel, primary forms	31,083	45,370	West Germany 26,725; United States 16,119; Japan 1,403.
Steel semimanufactures:			
Pipes and tubes	207,854	150,898	France 47,870; Italy 29,441; Japan 6,431.
Other	221,855	298,392	France 123,648; Belgium-Luxembourg 76,995.
Lead:			
Oxide	350	379	All from France.
Metal, including alloys, all forms	1,674	2,229	France 1,335; Belgium-Luxembourg 590; West Germany 301.
Nickel, including alloys, all forms	5	12	All from France.
Platinum group value, thousands	$228	$2	NA.
Silver, all forms do	$74	$99	Mainly from France.
Tin, including alloys, all forms long tons	71	28	All from France.
Titanium oxide	327	258	West Germany 160; France 98.
Zinc:			
Oxide and peroxide	351	--	
Metal, including alloys, all forms	1,270	1,509	France 931; Belgium-Luxembourg 469; West Germany 109.
Other:			
Scrap n.e.s	33	15	All from France.
Unwrought and semimanufactures	33	6	All from Belgium-Luxembourg.
NONMETALS			
Abrasives:			
Natural, except diamond	28,112	28,146	All from Italy.
Grinding stones	95	243	France 134; Switzerland 55; Italy 38.
Asbestos, crude	2,412	934	All from Canada.
Cement, hydraulic	30,734	93,533	Italy 36,285; Spain 29,722; Belgium-Luxembourg 22,577.
Chalk	6,853	8,143	All from France.
Clays and products:			
Crude	657	6,180	United Kingdom 4,787; France 1,393.
Products:			
Refractory	4,510	6,741	France 4,410; Italy 813; West Germany 627.
Nonrefractory	2,090	6,291	Italy 3,624; Spain 1,764; France 903.
Fertilizers, manufactured:			
Nitrogenous	94,024	34,875	France 17,327; Italy 11,238; West Germany 3,551.
Phosphatic	59,476	79,879	All from Spain.
Potassic	46,733	55,402	Spain 21,500; Belgium-Luxembourg 12,776; France 11,071.
Lime	4,408	5,267	All from France.
Magnesite	--	392	All from Austria.
Pigments, mineral, iron oxide	832	1,060	France 592; West Germany 468.
Sodium and potassium compounds, n.e.s	2,957	8,919	Italy 7,126; France 1,793.
Stone, sand and gravel:			
Dimension stone, marble	1,847	1,272	All from Italy.
Gravel and crushed stone	6,469	13,761	Italy 9,340; France 3,630; Spain 791.
Sulfur, elemental	10,501	10,431	France 10,231; Italy 200.
Talc and related materials	1,883	4,930	France 3,973; Italy 957.

See footnotes at end of table.

Table 3.—Algeria: Apparent imports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	1,459	1,721	France 928; Netherlands 687; United Kingdom 106.
Coal, all grades	66,914	51,654	United Kingdom 31,153; France 13,425; Spain 7,076.
Coke, all grades	124,248	247,431	Netherlands 134,689; West Germany 72,004; France 40,738.
Petroleum refinery products: [2]			
Gasoline:			
Aviation thousand 42-gallon barrels	70	39	NA.
Other do	86	--	
Kerosine do	--	25	Netherlands 12; Yugoslavia 9.
Distillate fuel oil do	--	1	All from West Germany.
Lubricants do	217	289	France 244.
Other do	948	999	NA.
Total do	1,321	1,353	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	1,865	6,206	Italy 5,130; France 1,076.

NA Not available.

[1] Compiled from export data of Australia, Austria, Belgium-Luxembourg, Canada, Denmark, Finland, France, West Germany, Greece, Iceland, Ireland, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the U.S.S.R., the United Kingdom, the United States, and Yugoslavia.

[2] Data from Foreign Service despatches.

Source: Except as noted, for the U.S.S.R.: Official trade returns of that country; for all other countries: Statistical Office of the United Nations; 1969 Supplement to the World Trade Annual. V. 3 (Africa), Walker and Co., New York, 1971, pp. 155–175.

country. In addition, the aerial survey will also cover most of the Algeria's Mediterranean shelf. This will be the first time Algeria has taken an overall look at its offshore possibilities. The Aero Service Corp. will use the most sophisticated equipment, including a laser profiler for vertical control.

Iron and Steel.—The Quenza-Bukhadra iron ore mine and the iron and steel plant El Hadjar remained the principal activities of the iron and steel industry of the country during 1971.

The production of iron ore from Quenza-Bukhadra mine accounted for two-thirds of the country's output. Other mines, Zaccara Timezit, Beni Saf, and Khanguet, contributed the remainder. To improve transportation of ore from the mine at Quenza, two Romanian-made locomotives were ordered. Eight additional locomotives will be ordered if the first prove satisfactory. Exploration of iron ore deposits at Gara Djebilet, located about 1,000 miles inland continued. However, only little reliable information was available, and most reports confirmed previously announced findings that the deposit had two zones of mineralization that totaled 900 million tons of iron ore reserves containing 58 percent iron. The construction of the iron and steel plant at El Hadjar remained the principal investment in the mineral-processing industry. When completed in 1974, the El Hadjar facility will have the capacity to produce 1.5 million tons of steel per year.

Lead and Zinc.—The principal lead and zinc activities were the development for production of the El Abed mine and the construction of a new beneficiation plant near Kazzet-Oncef. The new concentrator, which has a capacity of 70,000 tons of zinc concentrate and 15,000 tons of lead concentrate per year was near completion at yearend. At the construction site of a 40,000-ton-per-year zinc electrolytic plant near Ghazouete, a 270-ton-per-day sulfuric acid plant will be constructed. The Government-owned Société Nationale de Sidérurgié (SNS) has awarded a contract to Chemico for the construction of the sulfuric acid plant. The plant will use Chemico's own process for production of sulfuric acid using SO_2 gases from zinc roasters.

Mercury.—The 9 thousand 76-pound flasks-per-year mercury plant at Ismail near Azzaba started production in March 1971. The plant will process about 200 tons of mercury ore per day, which has an average mercury content of 0.75 percent. About 150 persons are employed at the Ismail mercury smelter.[3] The U.S.S.R. has provided technical assistance for construction of the smelter, and basic equipment was made in the U.S.S.R.

NONMETALS

Cement.—Construction of cement plants at El Hadjar and Meftah with an aggregate annual capacity of 1.5 million tons of cement continued during 1971. In addition, the expansion of cement plant at Zahana by 200,000 tons was underway at the yearend. The state-owned corporation Société Nationale des Matériaux de Construction (SNMC), which manages the cement industry of Algeria, expects the country to have operational by 1972–73 a cement-producing capacity of 2.6 million tons per year.

Fertilizer Materials.—Development of the Djebel Onk tricalcium phosphate deposit located in southeastern Algeria continued. A new 300-kilometer rail link between the mine at Djebel Onk and the port of Annaba has been completed. The completion of the first stage of development will bring the annual output of Djebel Onk to 700,000 tons of a high-grade product having 75 to 77 percent tricalcium phosphate from the present output of 500,000 tons. The second stage of development envisages the production of an additional 800,000-ton-per-year of medium-grade product by air separation on the site. Most of the Djebel Onk production will be transported by the recently completed 300-kilometer rail link to a fertilizer plant nearing completion at Annaba on the coast. Reportedly, the plant will be able to produce about 500,000 tons per year of phosphoric acid with an average P_2O_5 content of 50 percent. The second stage of construction planned for completion in 1975, should raise the annual capacity to 1 million tons of phosphoric acid.

Other Nonmetals.—Algeria produced a number of nonmetallic minerals during 1971. However, economic significance of Algeria's nonmetallics remained domestic and included among others production of barite, bentonite, kaolin, diatomite, marble, and salt. The kaolin mine at Djebel Debbagh has reserves of 180,000 tons, which produced about 4,000 tons of kaolin in 1971. Slightly over half of the production was delivered to the ceramic factory at Guelma, and the remainder was stockpiled. Another mine and plant located at Maghnia produced 4,000 tons of kaolin. All of Maghnia output was used for bleaching mineral and vegetable oils. Maghnia also produced bentonite as byproduct. Construction of a marble and granite works at Oran with a capacity of 150,000 square meters of marble and 10,000 tons of granite started in late 1971. Four marble and granite quarries located in western Algeria are expected to provide a continuous supply of materials for the Oran installations.

MINERAL FUELS

Coal.—Kenadza mine near Bechar was the only producer of coal in the country. The modest quantity of coal produced at Kenadza were consumed in the nearby Bechar powerplant. Imported coal was used for all other requirements in the country.

Natural Gas.—From its LNG facilities located at Arzew, Algeria remained an important supplier of LNG to the United Kingdom and France during 1971. While selling LNG to these two countries the Algerian Government through Sonatrach concluded long-term agreements for delivery of LNG to the United States. Furthermore negotiations with other West European countries for deliveries of LNG were underway at the yearend. To explore possibilities of supplying natural gas by a pipeline to Europe, the Government of Algeria has ordered a feasibility study for a pipeline from Algeria to Europe under the Mediterranean Sea.

The long-term arrangements for deliveries of LNG to the United States were in the center of activities related to the natural gas industry of Algeria. The El Paso-Sonatrach agreement, which was awaiting final approval from the (U.S.) Federal Power Commission calls for deliveries of 1,000 to 1,500 million cubic feet of gas equivalent per day for 25 years. If approved the El Paso-Sonatrach project will involve significant investments for new liquefying facilities, pipelines, ports facilities and the construction of special tankers in U.S. shipyards. In addition two installations for regasification will be built in the United States.

During 1971 Algeria became the first foreign supplier of LNG to the United States.

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[3] Sonarem. Le Secteur Minier et la Politique d'Industrialization. (Mineral Sector and the Policy of Industrialization.) Algiers, 1972, p. 62.

The 50,000-cubic-meter methane carrier "Discartes" flying a French flag loaded the first quantities of LNG at Arzew. This shipment was made under the provisions of agreement between Boston Gas Co. (a subsidiary of Distrigas Corp.) and Sonatrach for peak-shaving deliveries of 45.3 million cubic meters of gas equivalent per year. Moreover, a contract between Distrigas Corp., and Algeria for deliveries of 436 million cubic meters of gas equivalent (15,400,000 million cubic feet) per year was approved by the Federal Power Commission of the United States in March 1971. The Algeria's Société Mixte Algerienne de Gaz (Somalgaz) and French "Gas de France" announced in February the signing of a contract for deliveries of about 3.5 billion cubic meters of gas per year to France from the new liquefication facilities at Skidka.

Construction of LNG facilities at Skidka on the Mediterranean Coast continued during the year. The work on three LNG production lines proceeded according to plans. The French contractor Technip and the British participant King Wilkinson believe the plant will start production in 1972. The production of these three lines will be delivered to France. The contract for construction of a fourth LNG line at Skidka was awarded to Prichard-Rodes a British subsidiary of J. F. Pritchard and Co. of Kansas City. Reportedly output from the fourth line will be used to supply the markets in the United States. When completed in 1976 the Skidka LNG facilities will be able to process about 5 to 6 million cubic meters per year and will include construction of LNG storage tanks and new tanker loading facilities at Skidka.

A $300 million contract for building "the largest LNG facility in the World" was awarded to Chemico. Chemico will engineer and construct a facility for liquefying natural gas with a design capacity to process 10 billion cubic meters (354.1 billion cubic feet) of natural gas per year. The plant will be made up of six parallel liquefying units, three 100,000-cubic-meter LNG storage tanks, a powerplant, and cooling equipment. The new LNG plant will be constructed in Arzew in an area located between the existing liquefying facilities of Compagnie Algerian du Methane Liquide (Camel) and the Sonatrach's ammonia and fertilizer plant. The plant will use technology developed by Air Products Co., already in use at Libya's LNG plant at Marsa el Brega. Four years of construction will begin in 1972. To supply natural gas to new Skidka LNG facilities, a 40-inch pipeline has been completed by SNAM Progetti, S.p.A., a subsidiary of Ente Nazionali Idrocarburi (ENI) the Italian state petroleum agency. Reportedly, the line cost $100 million and the initial capacity is 6 billion cubic meters per year (212 billion cubic feet). At yearend the pipeline was not in use, and the line will await completion of the new LNG facilities at Skidka. To supply natural gas to new LNG installations at Arzew, a contract was awarded to SAIPEM, S.p.A. a subsidiary of ENI, for construction of 40-inch, 507-kilometer-long pipeline and a terminal at Arzew. Annual capacity of the pipeline was reported at 6.4 billion cubic meters (226.0 billion cubic feet) with the possibility of being expanded to 13.4 billions of cubic meters (473.2 billion cubic feet).

Algeria also recovered significant quantities of condensates and liquefied petroleum gases (LPG) by processing natural gas. Principal activities in the gas-processing sector included, among others, a natural gas separation plant that has an annual capacity of 1 million tons of LPG and 3 million tons of condensates with storage facilities for LPG at Arzew; new storage facilities for 530,000 tons of LPG at Skidka; two LPG extraction plants that have an aggregated annual capacity of 950,000 tons at Hassi Messaoud; a 1-million-ton-per-year pipeline from Hassi Messaoud to Arzew. Completion dates for most of these LPG projects range from 1972 to 1976.

Petroleum.—During 1971 activities of Algeria's petroleum industry were overshadowed by partial nationalization of French interests, by negotiation that followed, and by a sharp decrease in petroleum output. On February 24 the Algerian Government announced a decision to take over the majority of all French oil-producing interests. Consequently, the Algerian state-owned oil and gas monopoly Sonatrach assumed control of the industry during 1971. After nationalization, Sonatrach, Trough new joint companies will market approximately 77 percent of Algeria's petroleum production and 100 percent of its output from natural gas deposits. Tax revenue from oil should amount to $640 million, and total foreign exchange earnings should reach close to $1 billion. After the takeover, the French presence was limited to the role of minority partner in the newly organized joint companies. Without compensation to former owners, Algeria appropriated all associated gas and related facilities from oil-producing operations, all natural gasfields, and all gas and oil pipelines. At the same time, the Algerian Government increased the posted price for tax rate purposes to $3.60 per barrel retroactive to January 1969. This triggered retaliatory reaction by the French companies and Government. France withdrew its technicians from Algeria, declared that Algeria's crude oil no longer enjoyed a priviledged status in France, and initiated a boycott of Algerian crude. Negotiations lasted until the end of June when an agreement on compensation to Compagnie Francaise De Petroles (Algerie) (CFP) (A) was announced. Terms of the settlement included an indemnity of US$61 million for the CFP's nationalized interests to be payed in 7 years and the settlement of a tax dispute dating back to 1969, which should gain for the Algerians about $30 million. The settlement regulates conditions under which CFP's newly formed subsidiary Total-Algeria will operate as a minority partner to Sonatrach in a joint company setup by Algeria to take over the nationalized interests. The CFP's crude entitlement was fixed at 49 percent of Alrep's production and 33 percent of the Haoud Berkaoui Association. The agreement also regulates the investment obligations of CFP to increase the output of Hassi Messaudi oilfields. These obligations terminate when the field's output reaches 30 million tons per year. The agreement's major provisions are scheduled for revision within 5 years. Discussions for removal of agreements, if not completed successfully by October 31, 1975, will cause the agreement to lapse and Sonatrach can then buy out CFP's remaining interests. Although the compensation sum was not disclosed, the Elf/Erap settlement followed the broad framework of the CFP's agreement. The French portion of the output of Elf/Algeria (a joint company) will be reduced to 5.5 million tons per year in 1972 from 18 million tons before nationalization. It is expected to decline to 6.5 million tons in 1975. Approximately 70 percent of this production will come from Elf/Algeria's one-eight share of Hassi Messaudi field. The oil produced by Elf/Algeria will be exchanged with Sonatrach's oil from eastern Saharian oilfields. Then the eastern Saharian oil will be taken to the Tunisian coast through the Compagnie De Transport Par Pipeline Au Sahard (TREPSA) pipeline. The future Elf/Algeria investments were set at US$100 million for the period 1971–75. This amount will cover the tax paid, costs of own production, and investment obligations. The whole agreement covers a period of 10 years, but provisions were made for fundamental review after 5 years. The nationalization of French interests had made Sonatrach a major factor in Algeria's petroleum industry. The following tabulation shows the Sonatrach position before and after the nationalization.

	Under Sonatrach control before and after nationalization (Percent)	
Crude oil:		
Production	30	55
Recoverable reserves	30	55
Pipelines	60	100
Natural gas:		
Production	25	100
Recoverable reserves	30	100
Pipelines	51	100
Condensate:		
Production	30	100
Recoverable reserves	30	100

Having acquired control over most of its hydrocarbon resources, the Algerian Government started a broad program for expansion of the oil and gas industry.

Although large-scale seismic work by foreign contractors was discontinued in August when widespread suspensions of seismic contracts was put in force, about 227 crew-months (up 47 crew-months from 1970) of reflection work was conducted; about 181 crew-months were carried by Sonatrach. At the end of the year, 25 seismic crews were active in the country.

Twenty-two drilling rigs operated in the country during 1971 and drilled about 424,112 feet in 109 wells. Exploratory drilling totaled 187,000 feet in 25 completed wells. Of the total, 20 wells were dry. The Ait Kneir well in the Oued Noumer permit located south of Oued Noumer field (20 million tons estimated oil reserves), Stah Ibis well, located in the Illiz Basin, north of Alrar fields (estimated oil reserves of 80 million tons), and Draa El Termra well, located north of the Haoud Bozkaoui field (estimated oil reserves of 15 million tons) were reported as notable discoveries in Algeria during the year.

Development and extension drilling totaled 237,012 feet with 84 completed wells. Table 4 shows details of development and extension drilling in Algeria during 1970. Crude oil production was lower by about 17 percent when compared with that of 1970. Table 5 shows details of crude oil production of Algeria by fields and operations in 1971. The largest part of Algerian crude oil was exported to France and other non-Communist countries of Europe.

Construction of the petroleum refinery at Arzew continued, and the contractor Japan Gasoline expects to start production at the 2.5-million-ton-per-year refinery in 1972. At the same time, bids for a new refinery located at Skidka were requested. Capacity of the refinery was reported at 5 million tons per year. No information on the status of the refinery was available at yearend.

Table 4.—Algeria: Summary of extension and development drilling in Algeria in 1971

Company field	1971 Production	Dry wells	Rigs active Dec. 31, 1971
Alrep:			
Haoud Berkaoui	1	--	--
Hassi Messaudi N	13	--	4
C.P.A.:			
Hassi Chergui W	--	[1]1	--
Brides	--	[1]1	--
Creps: Zarzaitine	2	--	--
Petral: Gassi Touil	1	--	1
Repal:			
Hassi Messaudi S	30	1	4
Nezia	--	1	--
Sonatrach:			
Amassak	[1]1	--	1
Ait Kheir	1	--	1
Hassi R' Mel	7	--	1
Oued Noumer	--	1	--
Rhourde Adra	[1]1	--	--
Rhourde Nouss	[1]1	--	1
Stah	--	--	2
Tin Fouye-Tabankort	21	--	3
Total	79	5	18

[1] Extension.

Table 5.—Algeria: Crude production by field and operator, 1971

Company field	Discovery date	Average (BODP)	Change from 1970 (percent)
Alrep:			
Haoud Berkaoui	1964	28,230	−18.1
Hassi Messaoud N	1956	185,800	−17.5
C.P.A.: Gassi Touil E	1966	1,110	−22.4
Creps:			
Acheb	1963	2,260	−58.5
Alrar E [1]	1961	6,600	−9.7
Assekaifaf	1962	520	−10.3
Dome a Colenias	1959	250	−5.7
Edeyen	1964	790	−60.4
Edjeleh	1956	18,690	−31.3
El Adeb Larache	1958	4,280	−54.2
Hassi Mazoula	1962	140	−57.6
Hassi Mazoula S	1963	2,790	−48.8
In Akamil	1962	60	−47.8
La Reculée	1957	680	−48.1
Nord in Amenas [1]	1962	160	−34.7
Ohanet S	1962	9,050	−27.9
Ouan Teredert	1958	340	−8.1
Tan Emellel S	1960	380	−2.9
Tiguentourine	1956	4,080	−54.2
Tin Fouye N	1961	16,170	−63.8
Tin Fouye S	1962	70	−63.2
Zarzaitine	1957	41,770	−54.5
Ohanet N	1961	6,590	--
Petral:			
Askarene	1962	3,200	−30.7
Gassi Touil	1961	48,710	−3.8
Guelta	1962	2,790	−36.6
Repal:			
Hassi Messaoud S	1956	239,070	−12.9
Nezla E	1968	--	--
Nezla N	1965	7,190	+37.6
Sepal: El Gass El Agreb	1959	35,140	−20.8

See footnote at end of table.

Table 5.—Algeria: Crude production by fields and operator, 1971—Continued

Company field	Discovery date	Average (BODP)	Change from 1970 (percent)
Sonatrach:			
Djebel Onk	1960	860	−11.7
Djoua West	1967	1,220	−64.8
El Borma	1967	21,890	+41.0
Hassi Mazoula "B"	1964	380	−63.6
Hassi R' Mel [1]	1956	14,710	+6.4
Messdar E	1967	--	--
Messdar W	1967	20	−93.2
Oued Gueterini	1948	50	−16.7
Rhourde el Baguel	1962	55,130	−19.1
Rhourde Nouss	1962	3,080	−31.3
Timedratine E	1966	1,000	−50.6
Tin Fouye Tabankort	1966	27,470	+22.9
Tan Emellel N	1960	830	−18.6
Total	----	793,500	−17.3
Breakdown:			
Crude	----	772,030	−17.6
Condensate	----	21,470	−2.3

[1] Condensate.

The Mineral Industry of Angola, Mozambique, and Portuguese Guinea

By Henry E. Stipp [1]

ANGOLA

The mineral industry of Angola continued to make progress in 1971, accounting for 41.7 percent of total export earnings estimated at $459.7 million.[2] In addition to earnings of foreign exchange, Angola's extractive industries benefit the economy both by their consumption of local goods and services and by their contribution to the Government budget in the form of taxes, concession rentals, profit sharing and royalties. A total of 34,468 persons were employed by the mineral industry, of whom 607 were technicians; 649, administrative employees; 445, miners; 1,924, general employees; and 30,843, laborers.

A new consortium, established to exploit 95 percent of the diamond concession formerly held by Companhia de Diamantes de Angola (DIAMANG), signed a contract with the Government that would increase revenue in future years. The formation of the consortium Consorcio Mineiro de Diamantes (CONDIAMA) also will ensure new development capital for the diamond industry. However, prospects for the rapid development of Angola's minerals industry reportedly appear mixed, owing to low prices for phosphates, sulfur, and copper. The reluctance of the Portuguese Government to grant offshore petroleum concessions below the 11th parallel has prohibited considerable investment that could otherwise be expected to result from exploration activities.[3]

PRODUCTION AND TRADE

Production of most mineral commodities in 1971 generally increased in quantity and value compared with that of 1970. Statistics on the quantity of minerals produced in the last 3 years are shown in table 1. The total value of minerals production rose to an estimated $225.4 million in 1971, compared with a revised $199.0 million in 1970. Crude petroleum output increased in value 19 percent to $84.4 million compared with $70.7 million in 1970. Mine value of diamond produced in 1971 was about the same as the $62.7 million of 1970. Iron ore production was slightly larger in 1971 compared with 1970; the value increased 13 percent to $52.2 million as contrasted to $46 million in 1970.

Foreign trade in mineral commodities consisted mainly of exports of crude oil and petroleum products, diamond, and iron ore. Imports were principally iron and steel semimanufactures, coal, and fertilizer materials..

Crude oil exports in 1971 increased 15 percent to 35.3 million barrels valued at $76.5 million, compared with exports of 30.8 million barrels valued at 48.2 million in 1970. Japan, Canada, and Denmark were the principal destinations of Angolan crude oil in 1971. Exports of diamond in 1971 decreased 8 percent to 2.3 million carats valued at $56.4 million, compared with 2.5 million carats valued at $81.9 million in 1970. Iron ore exports in 1971 decreased 13 percent to 5.5 million tons valued at $44 million, compared with 6.4

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[1] Physical scientist, Division of Ferrous Metals.

[2] Where necessary, values have been converted at the rate of 1 escudo (Esc.)=US$0.037.

[3] U.S. Embassy, Luanda, Angola. State Department Airgram A-55, May 14, 1972, p. 2.

million tons valued at $50 million in 1970. Shipments went mainly to Japan, West Germany, France, and United Kingdom.

Statistics on exports and imports are shown in tables 2 and 3.

Table 1.—Angola: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1969	1970	1971 [p]
METALS			
Copper mine output, metal content	[r] 188	36	--
Gold mine output, metal content ... troy ounces	12	--	--
Iron ore and concentrate, gross weight ... thousand tons	5,478	6,052	6,158
Manganese ore and concentrate, gross weight [2]	29,070	23,000	23,000
NONMETALS			
Cement, hydraulic ... thousand tons	383	450	530
Clays, kaolin	1,310	2,396	1,040
Diamond:			
Gem [e] ... thousand carats	[r] 1,517	1,797	1,810
Industrial [e] ... do	[r] 505	599	603
Total ... do	2,022	2,396	2,413
Gypsum	16,397	18,200	19,793
Salt, marine	80,181	87,743	90,284
Stone:			
Granite, blocks ... cubic meters	7,130	3,184	5,648
Marble, blocks ... do	1,044	927	953
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	39,283	36,953	56,100
Natural gas:			
Gross production ... million cubic feet	14,000	28,749	[e] 33,100
Marketable production ... do	766	[e] 1,500	1,700
Petroleum:			
Crude ... thousand 42-gallon barrels	17,456	35,878	41,255
Refinery products:			
Gasoline ... do	524	477	445
Jet fuel ... do	375	587	558
Kerosine ... do	58	137	143
Distillate fuel oil ... do	734	734	752
Residual fuel oil ... do	2,324	2,609	2,590
Other ... do	144	175	195
Refinery fuel and losses ... do	320	283	281
Total ... do	4,479	5,002	4,964

[e] Estimate. [p] Preliminary. [r] Revised.

[1] In addition to the commodities listed, a variety of crude construction materials such as clays, sand and gravel, and broken stone presumably are produced for local consumption, but information is inadequate to make reliable estimates of output levels.

[2] Erroneously reported as thousand metric tons in previous edition of this table.

Table 2.—Angola: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum metal including alloys, scrap	410	NA	NA.
Beryl ore and concentrate	23	NA	NA.
Copper ore and concentrate	100	NA	NA.
Iron and steel:			
Ore and concentrate	[r] 5,129,678	6,355,525	Japan 2,496,114; West Germany 2,308,079; United Kingdom 570,831; France 424,381.
Metal:			
Scrap	315	NA	NA.
Semimanufactures	1,877	NA	NA.
Lead:			
Metal including alloys:			
Scrap	384	NA	NA.
Semimanufactures	1	NA	NA.
Manganese ore and concentrate	27,477	8,794	NA.
Platinum ... value	$5,347	NA	NA.
Tin including alloys, all forms ... long tons	8	NA	NA.
Zinc including alloys, all forms	16	NA	NA.
Other base metals including alloys, all forms n.e.s	5	NA	NA.

See footnotes at end of table.

Table 2.—Angola: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
NONMETALS			
Cement	55,384	74,636	Nigeria 29,287; St. Thomas and Principe 9,811; Republic of South Africa 7,768.
Diamond thousand carats	1,960	2,503	All to Portugal.
Fertilizer materials, mineral	3,012	NA	NA.
Gypsum and anhydrite	7,039	NA	NA.
Salt	20,625	33,309	Zaire 23,765; Zambia 5,593.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous (marble)	141	NA	NA.
Other (granite)	6,578	NA	NA.
Worked	15	NA	NA.
Quartz and quartzite	2	NA	NA.
Sand excluding metal bearing	2	NA	NA.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	128	NA	NA.
Coal and coke including briquets	80	NA	NA.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	10,826	30,765	Denmark 8,224; Netherlands 7,341; Japan 5,543; Spain 5,021.
Refinery products:			
Gasoline do	4	NA	NA.
Kerosine and jet fuel do	347	516	Mainly to bunkers.
Distillate fuel oil do	221	236	Bunkers 222.
Residual fuel oil do	1,670	1,920	Bunkers 1,124; Greece 289; United Kingdom 255; Ireland 136.
Lubricants do	4	NA	NA.
Total do	2,246	NA	

[r] Revised. NA Not available.

Table 3.—Angola: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum including alloys, all forms	1,104	1,171
Copper:		
Matte	37	NA
Metal including alloys, all forms	597	[1] 170
Iron and steel:		
Oxide and hydroxide	144	NA
Metal:		
Scrap	70	NA
Pig iron including cast iron	2,163	NA
Sponge iron, powder and shot	49	NA
Ferroalloys	1,180	NA
Steel primary forms	9,447	11,084
Semimanufactures	83,912	[2] 99,059
Lead:		
Oxide	66	NA
Metal including alloys, all forms	357	NA
Mercury 76-pound flasks	4	NA
Nickel including alloys, all forms	2	NA
Silver including alloys troy ounces	6,338	NA
Tin including alloys, all forms long tons	80	NA
Titanium oxides	242	NA
Zinc:		
Oxide	101	NA
Metal including alloys, all forms	590	NA
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc	19	NA
Grinding and polishing wheels and stones	74	NA
Asbestos	404	1,076
Barite and witherite	10	NA
Boron materials:		
Crude natural borates	(3)	NA
Oxide and acid	2	NA

See footnotes at end of table.

Table 3.—Angola: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970
NONMETALS—Continued		
Cement	3,519	4,256
Chalk	393	NA
Clays and products (including all refractory brick):		
Crude n.e.s	1,939	NA
Products:		
Refractory (including nonclay bricks)	530	NA
Nonrefractory	1,963	NA
Diatomite and other infusorial earths	340	NA
Feldspar	60	NA
Fertilizer materials:		
Crude:		
Phosphatic	50	NA
Other	10	NA
Manufactured:		
Nitrogenous	14,547	14,052
Phosphatic:		
Thomas (basic) slag	79	NA
Other	6,008	NA
Potassic	2,979	NA
Other including mixed	20,511	22,707
Ammonia	132	NA
Graphite, natural	3	NA
Gypsum and plasters	67	NA
Lime and limestone	69	NA
Magnesite	10	NA
Mica, all forms	129	NA
Pigments, mineral	580	NA
Salt and brine	795	NA
Sodium and potassium compounds n.e.s	2,559	NA
Stone, sand and gravel:		
Dimension stone:		
Crude and partly worked	486	NA
Worked	607	NA
Dolomite, chiefly refractory grade	88	NA
Gravel and crushed rock	194	NA
Sand excluding metal bearing	56	NA
Sulfur:		
Elemental, all forms	633	NA
Sulfur dioxide	11	NA
Sulfuric acid	1,389	NA
Talc, steatite, soapstone and pyrophyllite	141	NA
Other, n.e.s	19	NA
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	237	NA
Carbon black and gas carbon	507	NA
Coal and coke, including briquets	34,776	[4] 16,849
Gas, hydrocarbon	([3])	NA
Hydrogen, helium and rare gases	4	NA
Petroleum:		
Crude and partly refined thousand 42-gallon barrels	553	NA
Refinery products:		
Gasoline do	79	76
Kerosine and jet fuel do	258	[5] 44
Distillate fuel oil do	1,248	[6] 1,772
Lubricants do	107	[7] 7
Liquefied petroleum gas do	78	79
Mineral jelly and wax do	2	136
Other do	3	
Total do	1,775	2,114
Mineral tar and other coal–, petroleum–, or gas–derived crude chemicals	875	NA

NA Not available.

[1] Partial figure.

[2] Partial figure representing only selected classes of steel semimanufactures; the classes included accounted for 95 percent of the 1969 total.

[3] Less than ½ unit.

[4] Excludes coke, if any.

[5] Kerosine only.

[6] Includes jet fuel, residual fuel oil, and other "Oil for combustion" except gasoline, kerosine, and liquefied petroleum gas, but mainly distillate fuel oil.

[7] Partial figure, balance included with "other".

COMMODITY REVIEW

Metals.—*Copper.*—The mining license of Sociedade Mineira do Cubango S.A.R.L., which covered 1,930 square miles of land near Serpa Pinto, south-central Angola, was rescinded by the Portuguese Government.[4] Reportedly, the company failed to carry out an intensive survey for minerals and had not complied with capitalization requirements of $35,000. Mining activities in the concession area will be banned until yearend 1973. Sociedade de Investigações Mineiras (SIMEIRA) Ltda. continued reopening the old Mavoio and Tetelo mines in Uige District near Maquela do Zombo. Great Lakes Carbon Corp. of the United States filed for a copper concession in Cuanza Sul District near Cachoeiras do Bingo.

Iron Ore.—Reserves of more than 100 million tons of high-quality (low phosphorus and no titanium) iron ore located at Honde, west-central Angola, were being studied by personnel from the University of Luanda.[5] The deposits, which occur in a quartzite, magnetite, and hematite strata up to 328-feet thick, contain from 39.8- to 66.3-percent iron content.

Nothing further has been reported about the project to exploit deposits at Cassala-Quilungo, where estimated reserves total 500 million tons of ore with an iron content of 35 percent. A pelletizing and washing plant of 1.5-million-ton-per-year capacity will be required to exploit the deposits.

By yearend 1971, about $2.2 million was spent to renovate the Moçâmedes Railroad for transporation of iron ore from the Cassinga mines to the port of Moçâmedes. Companhia Mineira do Lobito (CML) reportedly shelved plans for constructing a plant to pelletize its large reserves of low-grade ore. The Government approved a new project to mine low-grade ore near CML operations in southern Angola.

Manganese.—The discovery of a deposit located at Miconje near the Cabinda—Republic of Zaire border was reported by the provincial directorate of the Mining and Geological Services.

Uranium.—Exploration for uranium was conducted by the West German firm Urangesellschaft and the Portuguese Nuclear Energy Board in the Dondo, Malange, and Moxico areas of Angola. Results of the surveys were not made public, and it appears that no significant traces of the metal were found.

Nonmetals.—*Cement.*—The 529,594 tons produced in 1971 was an increase of 18 percent above that of 1970; however, it was still below expectations. Companhia de Cimento Secil do Ultramar expected to reach production capacity of 600,000 tons per year at its Luanda plant. The other producer, Companhia de Cimentos de Angola had a capacity of 90,000 tons per year, but was expanding to eventually reach an annual output of 200,000 tons.

Diamond.—Production by DIAMANG increased slightly in 1971 compared with output in 1970. DIAMANG had 62 active mines; 40 in the Chicapa river basin, 14 in the Luachimo River Basin, northeastern Angola, and eight in the Cuanza River Basin, central Angola. Development of a rich deposit near Henrique de Carvalho will insure high levels of future production by DIAMANG. At the beginning of 1971, DIAMANG had 56 teams exploring its concession area. The purpose of these extensive operations was to select sections of land to be incorporated in the 19,300-square-mile area that DIAMANG will be allowed to keep after May 1971 under terms of its concession granted by the Portuguese Government in 1921. Areas inventoried included sections of the Luembe, Chiumbe, Luachimo, Chicapa, Luele, Cuango, Cuanza, Catumbela, Coporolo, Cubango, and Cunene River Basins. DIAMANG's original concession covered 395,650 square miles, of which 376,350 square miles was returned to the Government in May. Soon thereafter the Government awarded the relinguished concession area of DIAMANG to a new organization CONDIAMA formed by DIAMANG and DeBeers Consolidated Mines Ltd. of South Africa. The contract with CONDIAMA covers a period of 50 years during which the concession area will be reduced to 11,580 square miles by 1977, and after that, to the area of mine boundaries. The contract will be open for revision in 1986 and thereafter in each 10-year period. Ten percent of CONDIAMA's stock was given to the Government with an option to acquire an additional 15 percent of the stock after diamond production starts. The Government also received a 12.5-percent royalty on mine production, deductible from its share of profits, and a bonus of 5 percent of net profits that exceed a specified amount. DIAMANG and DeBeers will provide equal amounts of capital to CONDIAMA. The consortium will invest $8.4 million in its concession area by December 31, 1973, make loans to the Government of Angola, and contribute to the Overseas Mining Development Fund. Rental rates on the concession area will be set in 1973.

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[4] Engineering and Mining Journal. Angola. V. 173, No. 2, February 1972, p. 156.

[5] O Seculo (Lisbon). Iron Ore Reserves. Oct. 30, 1971, p. 19.

A subsidiary of Anchor Diamond Corp. of South Africa reportedly discovered a deposit along the coastal strip south of Luanda. A small firm, Companhia Internacional de Exploracões de Diamantes, ceased activities when its parent company, Diversa Inc. of the United States, went bankrupt.

Diatomite.—Production in the Farta Baia area of Benguela province, southern Angola, was scheduled to begin at yearend.

Phosphate Rock.—Companhia dos Fosfatos de Angola S.A.R.L. (COFAN), a subsidiary of the U.S. firm Pickands Mather & Co., and Portuguese interests expected to receive legal authority to build a 3-mile-long pier over the coastal shelf off Cabinda. COFAN will load phosphate rock into ore carriers by mechanical conveyors or by pipeline as slurry. Estimated cost for construction of the pier was more than $50 million.

Sulfur.—The U.S. firm Tenneco Inc. reportedly suspended exploration of its concession area near Benguela. Companhia de Minas de Angola (COMINAN), a subsidiary of Johannesburg Consolidated Investments Ltd., was granted a concession to explore for sulfur in the Lobito and Nova Redondo areas. COMINAN was required to invest at least $3.1 million in exploration activities in the next 3 years.

Mineral Fuels.—*Petroleum.*—There was no further progress toward construction of the petroleum refinery scheduled to be built by Sociedade Portuguesa de Exploração de Petróleos (ANGOL) at Lobito. The refinery, which has been authorized to process 650,000 tons per year of crude oil, will require an investment of $15.7 million. Completed plans for the refinery were presented to the provincial Government for approval.

The most important oilfields discovered so far are Lago and Lucula offshore from the Cabinda enclave, and Quenguela-Norte in central-western Angola. Cabinda Gulf Oil Co. operates the Lago and Lucula fields, and Companhia de Petróleos de Angola (PETRANGOL)-ANGOL, the Quenguela-Norte field. Most of the petroleum produced in Angola is high in sulfur and paraffin and cannot be exported except to countries that have special refinery equipment such as Denmark, Holland, and Spain. A portion of Angola's crude oil production is treated in the PETRANGOL refinery, where capacity was increased from 650,000 tons per year to 1 million tons per year.

Imperial Oil and Gas Co. requested an exploration concession located onshore from the eastern limit of the Interior Congo zone to the 13th meridian. Argo Petroleum Corp. requested scattered locations onshore and offshore both above and below the 11th parallel. Argo's application was approved and includes four concession areas on the southern coast near Farta Baia, Corunjamba, Moçâmedes and Praia do Navios. Argo is required to invest at least $4 million for exploration of these areas in the next 3 years.

MOZAMBIQUE

The mineral industry of Mozambique accounted for less than 0.4 percent of the gross national product (GNP) estimated at $1.974 million[6] in 1971. Although commercial development of minerals has been on a small scale, there is evidence that the mining industry will become more important in the near future. Increasing interest in the minerals sector is being shown by foreign mining organizations. The rail transit of minerals through Mozambique to ocean ports from neighboring countries also contributes significantly to the GNP. In 1970 Mozambique earned about $70 million from the transit rail trade. In September the Governments of Mozambique and Malawi inaugurated a new rail link connecting the Malawi rail system with the

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[6] Where necessary, values have been converted at the rate of 1 escudo (Esc.)=US$0.035.

Nacala-Vila Cabral railway. The port of Nacala has 1,388 feet of wharf with an annual capacity of 750,000 tons. Two new wharfs totaling 1,880 feet in length were under construction at Nacala.

Prospecting rights to 9,200 square miles in the Tete area were granted to a consortium headed by Johannesburg Consolidated Investment Co. of South Africa.[7] The rights are good for 5 years and can be renewed for a period of 4 years. The mining lease covering the concession was guaranteed for a 60-year period.

PRODUCTION AND TRADE

Production of mineral commodities (excluding petroleum products) in 1971 increased in value to an estimated $18 million compared with $15 million in 1970. The principal commodities produced were petroleum products, cement and coal.

Exports of mineral commodities were valued at $14.6 million in 1970. They consisted mainly of petroleum products valued at $11 million, columbium and tantalum minerals valued at $1.4 million, and bituminous coal valued at $821,000. Statistics on production, exports and imports are shown in tables 4, 5, and 6.

COMMODITY REVIEW

Metals.—*Beryl, Columbite-Tantalite.*—Namagoa Plantations Co. was granted a 205,680-acre concession in the Munhamade Administrative Post of Lugela Cirumscription, Zambezia District, to exploit beryl and columbite-tantalite.[8] A deposit of columbite-tantalite was discovered in Dondo Concelho near the Púnge River.

Copper.—Reportedly a South African company was investing about $1.9 million in Mozambique's copper mining industry.[9] Large deposits were thought to occur northeast of Tete, and encouraging signs have been obtained from preliminary drilling. It was estimated that copper exports to Japan could be worth up to $600,000 per year. A new concentrator was being installed at the copper mine of Edmundian Investments (Pty) Ltd.[10] located near Mount Isitaca about 130 miles northwest of Beira. This will increase output capacity three times the present rate. In the last 2 years $700,000 has been spent to develop the mine, and considerable amounts will be required to make the mine fully operational. Copper minerals also were being mined from deposits near Serra Mangote.

Iron Ore.—A deposit located in Manica District near the Mozambique-Rhodesia border, was discovered by a consortium, the Hondeminas Co. Reportedly, this was the fourth iron ore deposit found in the area. Three deposits of magnetite were found in Niassa district, northern Mozambique. Two are located near the town of Maniamba, and the other is located north of the Vila Cabral district capital.

A Lourenço Marques firm obtained Government permission to establish a steel wire factory in Mozambique.[11] The factory will have an output of 5,200 tons per year.

Nickel.—A South African company was scheduled to spend from $7.2 million to $12 million for exploration and mining activities associated with nickel deposits near Serra Mangote, 5 miles from Vila de Manica.[12] If results of the survey are favorable, production of nickel could start by 1974.

Pollucite.—One hundred tons of cesium ore with a cesium content of 18 percent or higher, was mined by Sociedade Mineira do Marropino, Lda., Pebane.[13] Fifty tons valued at $7,839 was exported to the Netherlands in 1970. In addition to pollucite, the company also mines columbite-tantalite and beryl ores.

Uranium.—Deposits of ore that have a high uranium content have been discovered near Quelimane, Zambezia District, by the Uranium Co. of Mozambique.

Nonmetals.—*Cement.*—The capacity of Companhia de Cimentos de Moçambique S.A.R.L. Matola plant will be increased by 2,000 tons per day with installation of a

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[7] Mining Journal. Mozambique. V. 277, No. 7095, Aug. 13, 1971, p. 135.

[8] Industries Et TRAVAUX D'OUTREMER. Mozambique. No. 216, November 1971, p. 957.

[9] Work cited in footnote 7.

[10] Barclays Overseas Review (London). Mozambique. July 1971, p. 43.

[11] Barclays Overseas Review (London). Mozambique. August 1971, p. 40.

[12] Barclays Overseas Review (London). Mozambique. May 1971, p. 32.

[13] U.S. Embassy, Lourenço Marques. State Department Airgram A-32, March 10, 1972, p. 1.

Table 4.—Mozambique: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1969	1970	1971 [p]
METALS			
Aluminum, bauxite, gross weight	4,393	7,146	7,713
Beryllium, beryl concentrate, gross weight	122	33	13
Bismuth mine output, metal content	3	1	1
Cesium mineral, pollucite, gross weight	200	100	--
Columbium and tantalum ore and concentrate, gross weight:			
Columbite-tantalite	64	97	59
Microlite	82	64	15
Copper ore and concentrate:			
Gross weight	--	602	1,654
Metal content	--	130	414
Gold mine output, metal content troy ounces	21	34	21
Rare-earth minerals, gross weight:			
Betafite kilograms	1,350	NA	NA
Euxenite do	9,550	NA	NA
Monazite do	--	2,100	--
Tin ore and concentrate:			
Gross weight long tons	(2)	--	--
Metal content do	(2)	--	--
Tungsten ore and concentrate, scheelite:			
Gross weight kilograms	2,000	NA	NA
Metal content do	[e] 950	NA	NA
NONMETALS			
Abrasives, natural, garnet do	1,332	2,300	1,744
Asbestos	787	228	1,431
Cement, hydraulic thousand tons	306	385	420
Clays:			
Bentonite (including montmorillonite)	[r] 4,239	6,483	6,374
Kaolin (including china)	1,270	1,477	1,586
Diatomite	120	--	--
Feldspar	[r] 200	--	--
Fluorspar	--	1,136	8,218
Gem and ornamental stones:			
Amazonite kilograms	52	NA	3,500
Beryl crystals do	349	118	143
Obsidian do	192,494	248,400	244,150
Samarskite do	1,920	NA	--
Tourmaline do	6,250	6,209	3,495
Lime	NA	NA	3,156
Lithium minerals:			
Amblygonite	1	13	--
Lepidolite	391	24	1
Spodumene	27	NA	NA
Mica, mainly scrap	350	253	950
Quartz crystal kilograms	160,000	--	--
Salt, marine	9,545	28,742	27,763
Sand, quartz	NA	NA	6,813
Stone:			
Limestone thousand tons	595	674	NA
Marble do	415	NA	NA
Granite and quarry, n.e.s do	NA	NA	761
MINERAL FUELS AND RELATED MATERIALS			
Coal, bituminous do	277	351	329
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	1,214	1,137	1,113
Distillate fuel oil do	1,634	1,431	1,449
Residual fuel oil do	2,349	2,208	2,291
Other do	271	324	344
Refinery fuel and losses do	758	476	848
Total do	6,226	5,576	6,045

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, there may be additional quantities of crude construction materials (clays, sand and gravel, and stone) produced for local use, but information is inadequate to make reliable estimates of output levels.

[2] Less than ½ unit.

Table 5.—Mozambique: Exports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum metal and alloys, all forms	[1] 101	NA
Columbite-tantilite concentrates, gross weight	78	188
Copper metal and alloys, all forms	[1] 493	NA
Iron and steel scrap	9,010	NA
Lead metal and alloys, all forms	[1] 249	NA
Tin metal and alloys, all forms ... long tons	[1] 1	NA
Zinc metal and alloys, all forms	[1] 10	NA
Other:		
Ores and concentrates n.e.s	90	NA
Metal, all forms	[1] 4	NA
NONMETALS		
Asbestos	841	316
Cement, hydraulic	29,056	19,820
Clays, crude, bentonite	2,790	5,047
Salt	5,698	4,951
MINERAL FUELS AND RELATED MATERIALS		
Coal	94,914	108,099
Petroleum refinery products:		
Gasoline ... thousand 42-gallon barrels	752	700
Jet fuel ... do	62	151
Distillate fuel oil ... do	721	691
Residual fuel oil ... do	1,880	2,062
Other ... do	135	163
Total ... do	3,550	3,767

NA Not available.

[1] Includes unspecified quantities of manufactures.

Table 6.—Mozambique: Imports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum metal and alloys, all forms	[1] 861	700
Copper metal and alloys, all forms	367	NA
Iron and steel semimanufactures	67,912	[2] 78,399
Lead metal and alloys, all forms	[1] 198	NA
Nickel metal and alloys, all forms	[1] 3	NA
Tin metal and alloys, all forms ... long tons	[1] 25	NA
Zinc metal and alloys, all forms	[1] 92	NA
Other:		
Ores and metal bearing residues	4,397	NA
Metals, all forms n.e.s	7	NA
NONMETALS		
Fertilizer materials, crude and manufactured	20,922	32,994
Others not further described	27,386	NA
MINERAL FUELS AND RELATED MATERIALS		
Coal	435,895	335,559
Coke and briquets	2,244	NA
Petroleum:		
Crude ... thousand 42-gallon barrels	[r] 6,238	5,576
Refinery products: [2]		
Gasoline ... do	238	296
Kerosine ... do	167	187
Fuel oil, distillate and residual ... do	636	710
Lubricants ... do	90	111
Total ... do	1,131	1,304

[r] Revised. NA Not available.

[1] Includes unknown quantities of manufactures.

[2] Partial figure, but believed to represent by far the largest part of the total.

dry process kiln. A new mill was installed at the Nova Maceira Cement Co. plant in Beira. New equipment being installed will increase production capacity of the plant to 300,000 tons per year. The increased output will supply requirements of the Cabora Bassa Dam project.

Mineral Fuels.—*Coal.*—Companhia Carbonifera de Moçambique located at Moatize, 12 miles north of Tete, was the major mineral producer in the province. In 1970, production increased to 351,000 tons, of which 226,000 tons was consumed domestically by the railways and the cement industry, and the remainder, was exported to Kenya, Japan, Angola, and Malawi. The high-grade, coking-quality coal is mined from a 7,413-acre concession. Reserves have been estimated at 100 million tons. Employment at the mines included 950 African laborers and 62 staff (28 Europeans). Housing and medical care are provided by the company, which pays about $1.50 per day for unskilled labor. Increased production is restricted by poor rail transport and port facilities and a limited domestic market.

Petroleum and Natural Gas.—Mozambique Amoco Oil Co. was active in the concession area it took over from Mozambique Gulf Oil Co. in late 1970. Gulf assigned its 50-percent interest on 11.8 million acres near Beira to the Indiana Standard affiliate, which became sole holder of the concession rights. Gulf abandoned its search for petroleum after 22 years of fruitless exploration. At yearend, Hunt International Drilling Co., which had been operating a drilling rig offshore from Beira, also gave up the search for crude oil. Sunray Mocambique Oil Co., which was operating for Clark Oil and Refining Co. and Skelly Oil Co., abandoned its prospecting work offshore north of Laurenço Marques, and departed from Mozambique. In June the Franco-German-South African consortium Société National des Pétroles d'Aquitaine reduced its concession area by 25 percent to 17,610 square miles. The area relinquished is on the southern coast in the Inhambane region west of the mouth of the Zambezi River. A total of 43,000 feet were drilled unsuccessfully by the group. Operations were being concentrated on its other concession in the Zambezi Valley north of Beira.[14]

The natural gas discovered at Pande in 1965 by Mozambique Amoco has not been developed; however, there has been much speculation that a pipeline would be built to the Republic of South Africa. Apparently, the market for natural gas in Mozambique is too small to warrant development of the field at this time.

At yearend it was reported that Société National des Pétroles d'Aquitaine discovered a large petroleum deposit 15 miles west of the tourist resort of Sengo, north of Beira.[15] This would be the first oil deposit discovered on the east coast of Africa; however, it was too early to tell if the deposit was commercial, because the information was based upon the results of one drill hole.

PORTUGUESE GUINEA

Esso Exploration Guinea Inc. holds a 19,295-square-mile petroleum exploration concession covering an area mostly offshore. In 1970 the company conducted 1 week of offshore seismic surveying. The only other activity involving minerals was trade with other countries. Inasmuch as Portuguese Guinea produces only a few minerals for local consumption, such as salt, sand and gravel, and stone, trade in mineral commodities is confined largely to imports. The main mineral commodities imported in 1971 were cement, iron and steel semimanufactures, and mineral fuels.

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[14] Petroleum Press Service. News In Brief. V. 38, No. 8, August 1971, p. 313.

[15] Industries Et TRAVAUX D'OUTREMER. Mozambique. No. 219, February 1972, p. 167.

The Mineral Industry of Argentina

By Gordon W. Koelling [1]

Although Argentina is one of the most industrialized countries in South America, its mineral industry plays a relatively small role in the economy; less than 2 percent of the country's gross domestic product (GDP) was accounted for by crude minerals output in 1971. Consequently, Argentina is heavily dependent upon imports to supply its mineral requirements.

In order to increase minerals production and lower imports, the Government initiated a 5-year exploration and mining plan in 1971.

Approximately three-fourths of the funds allocated to this plan are earmarked for the development of a new iron ore project. Other funds are to be allocated to programs designed to improve small- and medium-sized mining operations. Attempts will be made to increase the production from these operations and the regional vertical integration of related industries will be encouraged. The plan also calls for prospecting in many of the country's areas considered to have mineral potential.

The Government also opened a new source of credit through the Banco Nacional de Desarollo to promote mining ventures by local companies. Under this program, loans for mine development work can equal up to 300 percent of a company's capital. Interest on these loans will be 8 percent, about one-third the normal prevailing rate of interest. Special credits for prospecting are also available under the program. Other loans, to develop sales and markets, can be obtained at interest rates ranging from 8 percent to 16 percent. Such loans are not to exceed 50 percent of a company's capital.

PRODUCTION

Production of some of the country's most important mineral commodities such as crude oil, refinery products, natural gas, and crude steel registered significant gains during 1971. The performance of other segments of Argentina's mineral industry was mixed.

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[1] Geographer, Division of Fossil Fuels.

Table 1.—Argentina: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity[1]	1969	1970	1971[p]
METALS			
Antimony mine ouput, metal content kilograms	[r] 1,092	800	[e] 1,000
Beryllium, beryl concentrate, gross weight	518	302	[e] 300
Bismuth mine output, metal content kilograms	875	42	[e] 500
Chromium, chromite, gross weight	[r] 730	30	NA
Columbium-tantalum, columbite-tantalite concentrates, gross weight kilograms	[r] 1,655	4,490	[e] 4,500
Copper:			
Mine output, metal content	456	461	[e] 465
Smelter output[e]	300	300	300
Gold mine output, metal content troy ounces	16	--	NA
Iron and steel:			
Iron ore and concentrate thousand tons	299	239	[e] 240
Pig iron do	[r] 588	815	859
Ferroalloys, electric furnace do	24	31	[e] 31
Crude steel do	[r] 1,690	1,823	1,951
Semimanufactures (rolled only) do	[r] 2,001	2,233	2,475

See footnotes at end of table.

Table 1.—Argentina: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity[1]	1969	1970	1971[p]
METALS—Continued			
Lead:			
Mine output, metal content	38,692	35,588	38,100
Smelter	22,000	38,100	43,500
Manganese ore and concentrate, gross weight:			
30 to 40 percent manganese	21,859	31,613	[e]32,000
Less than 30 percent manganese	14,652		
Silver mine output, metal content ... thousand troy ounces	3,109	[e]2,800	[e]3,100
Tin mine output, metal content ... long tons	855	1,153	[e]1,000
Tungsten mine output, metal content	146	178	[e]180
Uranium mine output, U_3O_8 content ... kilograms	[r]49,043	49,000	[e]50,000
Zinc:			
Mine output, metal content	31,685	38,985	40,000
Smelter	[r]24,600	32,000	33,000
NONMETALS			
Abrasives, natural, n.e.s., garnet	100	60	NA
Asbestos	326	35	[e]40
Barite	26,990	26,589	[e]25,000
Boron minerals, crude	31,788	43,346	NA
Cement, hydraulic ... thousand tons	[r]4,348	[2]4,743	5,552
Chalk	54,475	61,126	NA
Clays:			
Bentonite	62,139	73,660	[e]75,000
Foundry earth	5,822	2,024	NA
Fuller's earth (decolorizing clay)	12,164	3,816	NA
Kaolin	80,905	74,555	[e]75,000
Refractory	134,706	115,941	NA
Other ... thousand tons	[3]2,094	2,344	NA
Diatomite	10,339	8,228	[e]8,000
Feldspar	21,836	29,536	[e]30,000
Fertilizer materials, crude natural phosphates (guano)	491	317	NA
Fluorspar	29,377	29,655	[e]30,000
Graphite	[r]293	76	[e]80
Gypsum, crude	535,306	421,563	[e]420,000
Lithium minerals	352	245	[e]250
Mica:			
Sheet	119	90	[e]80
Waste and scrap	573	1,314	[e]700
Pigment, natural mineral, ocher	310	60	NA
Pumice and related volcanic materials	29,892	32,617	[e]33,000
Rhodochrosite	119	164	NA
Salt:			
Rock	[r]1,478	1,160	[e]960,000
Solar	[r]470,361	957,566	
Sand and gravel:			
Sand:			
Construction ... thousand tons	9,101	9,236	NA
Silica sand (glass sand) ... do	271	182	NA
Gravel ... do	[r]7,103	8,956	NA
Stone:			
Dimension:			
Alabaster	976	--	NA
Flagstone	69,913	64,974	NA
Granite	18,255	18,530	NA
Marble and other calcareous, n.e.s	26,002	26,414	NA
Sandstone	6,636	16,796	NA
Crushed, broken and unspecified:			
Basalt ... thousand tons	2,147	2,084	NA
Calcite, nonoptical	10,023	10,448	NA
Dolomite ... thousand tons	162	214	NA
Granite, crushed ... do	8,050	6,000	NA
Limestone ... do	15,352	11,983	NA
Marble rubble ... do	70	75	NA
Quartz ... do	48	76	NA
Quartzite ... do	1,135	1,427	NA
Serpentine	[r]23,750	30,156	NA
Shell marl	[r]109,496	103,687	NA
Slate	NA	21	NA
Strontium minerals, celestite	13	426	[e]450
Sulfur, elemental, refined	34,579	39,564	[e]40,000
Sulfates, natural:			
Aluminum (alum)	6,242	14,080	NA
Iron (melanterite)	165	376	NA
Magnesium (epsomite)	1,317	1,172	NA
Sodium (mirabilite)	26,980	34,993	NA
Talc and related materials:			
Pyrophyllite	6,432	6,860	[e]7,000

See footnotes at end of table.

Table 1.—Argentina: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity[1]	1969	1970	1971[p]
NONMETALS—Continued			
Talc and related materials—Continued			
Steatite	4,528	5,376	[e]5,000
Talc	21,713	18,668	[e]19,000
Vermiculite	4,557	3,238	[e]3,600
Water, mineral	28,992	26,589	NA
Zeolite	48	75	NA
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	[r]4,385	5,575	NA
Carbon black	24,000	[e]30,000	[e]30,000
Coal, bituminous ... thousand tons	522	616	631
Coke, all types including breeze ... do	361	[e]360	[e]360
Gas, natural:			
Gross production ... million cubic feet	247,294	270,683	286,654
Marketed ... do	188,133	212,452	229,323
Natural gas liquids:			
Natural gasoline[4] ... thousand 42-gallon barrels	458	645	NA
Liquefied petroleum gas ... do	1,312	NA	NA
Peat, agricultural	536	3,407	[e]3,400
Petroleum:			
Crude oil ... thousand 42-gallon barrels	130,086	143,428	154,514
Refinery products:			
Aviation gasoline ... do	419	377	381
Other gasoline ... do	33,164	33,559	36,751
Jet fuel ... do	2,212	2,341	2,753
Kerosine ... do	6,427	6,880	5,847
Distillate fuel oil ... do	31,757	34,915	41,651
Residual fuel oil ... do	55,235	59,609	[5]58,364
Lubricants ... do	1,036	1,084	1,062
Other:			
Naphtha ... do	654	[e]700	[5]4,806
Liquefied petroleum gas ... do	4,156	[e]4,200	[5]6,823
Petroleum coke ... do	2,908	3,645	2,393
Asphalt ... do	4,803	4,205	4,431
Solvents ... do	395	410	488
Other ... do	222	350	418
Refinery fuel and losses[5] ... do	1,735	[e]1,830	[5]449
Total ... do	145,123	154,105	166,617

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, cadmium metal, lime, perlite, Thomas slag, and urea are also produced but output is unreported and available information is inadequate to make reliable estimates of output levels.

[2] Excludes white cement, which totaled 41,831 tons in 1969.

[3] Revised to exclude foundry earth, included with "Other clays" in previous editions, but now reported separately.

[4] Includes material reported in official sources as "naphtha for reforming" as well as that reported as natural gasoline.

[5] Data for refinery fuel and losses (derived by subtraction of reported individually listed products from reported total refinery input) appears inadequate to maintain refinery operations at the indicated level; a portion of the recorded production of residual fuel oil, naphtha and/or liquefied petroleum gas presumably may have been used for refinery fuel.

TRADE

Argentina's mineral industry continued to experience a serious unfavorable balance of trade during 1971. The items contributing primarily to the total value of mineral imports included iron ore and steel, copper, and aluminum.

Table 2.—Argentina: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum:		
Oxide (alumina) and hydroxide	NA	5
Metal including alloys, all forms	282	306
Antimony metal including alloys, all forms	NA	87
Beryllium, beryl ore and concentrate	527	50
Cadmium metal including alloys, all forms	--	11

See footnotes at end of table.

Table 2.—Argentina: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS—Continued		
Copper:		
Ore and concentrate[1]	826	564
Metal including alloys, all forms	274	105
Iron and steel:		
Metal:		
Ferroalloys	NA	1,205
Ingots and other primary forms	1	336
Semimanufactures:		
Bars and rods:		
Wire rods	92,518	29,061
Other	8,170	60,374
Angles, shapes, and sections	30,587	38,483
Universals, plates, and sheets	2,804	53,907
Hoop and strip	NA	722
Rails and accessories	NA	17
Wire	4,424	5,303
Tubes, pipes, and fittings	59,905	20,614
Castings and forgings	83	72
Lead ore and concentrate	4,113	1,184
Mercury 76-pound flasks	NA	5
Silver metal thousand troy ounces	18	132
Tantalite ore and concentrate kilograms	--	1,050
Tin:		
Ore and concentrate long tons	5,627	5,058
Oxides do	NA	5
Tungsten:		
Ore and concentrate	193	198
Metal including alloys, all forms kilograms	NA	2
Zinc:		
Oxide do	NA	2,125
Metal including alloys, all forms	2,550	2,841
Other:		
Ore and concentrate	32	268
Ash and residue containing nonferrous metals	1,232	2,811
Waste and sweepings of precious metals kilograms	NA	612
NONMETALS		
Abrasive, natural, n.e.s.:		
Pumice, emery, natural corundum, etc do	NA	1,200
Grinding and polishing wheels and stones do	NA	3,792
Asbestos	6	4
Barite	100	165
Boron materials:		
Crude natural borates	232	535
Oxides and acid	NA	43
Cement	34,628	3,740
Chalk	18	--
Clays and products (including all refractory brick):		
Crude n.e.s.:		
Bentonite	7,765	6,132
Kaolin	73	77
Other	18	391
Products:		
Refractory (including nonclay bricks and cement)	NA	77
Nonrefractory	NA	355
Diatomite and other infusorial earths	24	39
Fluorspar	499	679
Fertilizer materials:		
Crude:		
Nitrogenous	NA	4
Manufactured:		
Nitrogeneous		2,292
Phosphatic:		
Thomas slag		235
Potassic		20
Mixed		1,990
Ammonia		482
Graphite, natural	NA	2
Gypsum and plasters	9,792	12,240
Lime	108	41
Lithium and lithium compounds	NA	20
Mica including splittings and waste	330	903
Pigments, mineral:		
Natural, crude	NA	3
Iron oxide, processed		5
Salt	62,691	84,161
Sodium compounds n.e.s., caustic soda	NA	141

See footnotes at end of table.

Table 2.—Argentina: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970
NONMETALS—Continued		
Stone, sand and gravel:		
Dimension stone:		
Crude	8,473	2,011
Worked		5,228
Dolomite	2,730	1,490
Gravel and crushed rock	NA	25
Quartz	3	3
Sand	NA	46
Ornamental:		
Onyx	15	--
Rhodochrosite	21	18
Sulfuric acid	NA	449
Talc, steatite, soapstone, and pyrophyllite	330	80
Other nonmetals n.e.s.:		
Crude	632	8
Slag, dross and similar waste, not metal bearing		926
Bromine, iodine and fluorine		8
Oxides, hydroxides and peroxides of strontium, barium, or magnesium		172
Building materials of asphalt, asbestos and fibre cement and unfired nonmetals n.e.s		614
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	2,071	1,260
Carbon black	3,096	3,665
Coal, all grades	25,329	1,879
Coke and semicoke		12,670
Rare gases, argon and other kilograms	NA	463
Petroleum:		
Crude thousand 42-gallon barrels	455	(2)
Refinery products:		
Gasoline do	12	128
Kerosine do	5	--
Distillate fuel oil do	24	21
Residual fuel oil do	639	611
Lubricants do	39	55
Other do	987	986
Mineral tar and other coal–, petroleum–, or gas–drived crude chemicals	2,023	208

NA Not available.

[1] Including concentrates containing significant amounts of silver.

[2] Less than ½ unit.

Source: Instituto Nacional de Estadistica y Censos. Comercio Exterior, Part II, 1969 and 1970.

Table 3.—Argentina: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum:		
Bauxite and concentrate	29,917	41,652
Oxide (alumina) and hydroxide	9,156	7,814
Metal including alloys, all forms	53,710	51,495
Antimony:		
Ore and concentrate	369	67
Metal including alloys, all forms	NA	1
Arsenic:		
Trioxide and acids	468	569
Metal including alloys, all forms	NA	65
Bismuth metal including alloys, all forms	22	14
Cadmium metal including alloys, all forms kilograms	NA	385
Chromium:		
Chromite	4,744	8,113
Oxide and hydroxide	NA	17
Metal including alloys, all forms	NA	3
Cobalt:		
Oxide and hydroxide	15	10
Metal including alloys, all forms	79	59
Copper:		
Ore and concentrate	NA	1,111
Metal including alloys, all forms	29,132	23,549
Gold metal unworked or partly worked troy ounces	NA	183,130
Iron and steel:		
Ore and concentrate thousand tons	467	1,448
Metal:		
Scrap do	199	5

See footnotes at end of table.

Table 3.—Argentina: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970
Metals—Continued		
Iron and steel—Continued		
Metal—Continued		
Pig iron including speigeleisen thousand tons	362	123
Sponge iron, powder and shot	NA	1,206
Ferroalloys	3,266	3,159
Ingots and other primary forms thousand tons	781	1,064
Semimanufactures:		
Bars and rods do	27	25
Angles, shapes, and sections do	31	35
Universals, plates, and sheets:		
Tinned plates and sheets do	133	110
Other coated plates and sheets do	7	13
Other (uncoated) do	295	253
Hoop and strip do	12	16
Rails and accessories do	13	10
Wire do	2	2
Tubes, pipes, and fittings do	39	18
Castings and forgings	NA	153
Lead:		
Oxides	NA	30
Metal including alloys, all forms	1,208	1,705
Magnesium metal including alloys, all forms	675	377
Manganese:		
Ore and concentrate	20,168	34,175
Oxides	3,702	3,416
Metal	58	52
Mercury 76-pound flasks	552	627
Molybdenum metal including alloys, all forms	NA	12
Nickel metal including alloys, all forms	573	680
Platinum-group metals and silver:		
Platinum group troy ounces	84,653	2,476
Silver do		139,663
Rare-earth metals and compounds	16	42
Selenium, elemental	11	7
Tellurium kilograms	NA	200
Tin metal including alloys, all forms long tons	1,292	1,110
Titanium:		
Ore and concentrate	1,245	1,348
Oxides	964	1,494
Metal including alloys, all forms	NA	6
Tungsten metal including alloys, all forms	NA	4
Zinc:		
Oxide	NA	85
Metal including alloys, all forms	5,079	5,970
Zirconium:		
Ore and concentrate	1,079	987
Other:		
Oxides, hydroxides and peroxides of metals n.e.s.	NA	323
Metals including alloys, all forms:		
Metalloids n.e.s.	NA	3,194
Pyrophoric alloys	NA	3
Base metals n.e.s	NA	1
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc	372	289
Grinding and polishing wheels and stones	NA	148
Asbestos	16,451	21,106
Barite and witherite	119	40
Bromine	117	118
Cement	345,406	300,216
Chalk	337	345
Clays and products (including all refractory brick):		
Crude n.e.s.:		
Bentonite	NA	2
Fire clay	222	177
Kaolin	15,579	14,962
Andalusite, kyanite, and sillimanite	331	1,066
Other	7	239
Products:		
Refractory (including nonclay bricks and cement)	14,201	20,313
Nonrefractory	2,551	5,820
Cryolite and chiolite	NA	58
Diamond:		
Gem thousand carats	(1)	6
Industrial do	(1)	215
Powder do	(1)	89
Diatomite and other infusorial earths	1,988	2,578
Feldspar and fluorspar	NA	165

See footnotes at end of table.

Table 3.—Argentina: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970
NONMETALS—Continued		
Fertilizer materials:		
Crude:		
Nitrogenous	10,640	13,470
Manufactured:		
Nitrogenous	30,219	4,562
Phosphatic:		
Thomas slag	9,756	170
Other		16,267
Potassic	8,539	14,922
Mixed	38,830	39,520
Ammonia	NA	4
Graphite, natural	347	433
Gypsum and plaster	41	28
Iodine	56	62
Lime	(2)	1
Lithium and lithium compounds	82	--
Magnesite	13,880	21,423
Mica:		
Crude including splittings and waste	22	44
Worked including agglomerated splittings	NA	10
Pigments, mineral:		
Natural, crude	74	140
Iron oxides processed	NA	435
Precious and semiprecious stones, except diamond ... thousand carats	NA	11,900
Pyrite (gross weight)	NA	13
Salt and brine	NA	16
Sodium and potassium compounds n.e.s.:		
Caustic soda	14,785	13,465
Caustic potash, sodic and potassic peroxides	788	1,087
Sodium carbonate, natural, and manufactured (soda ash)	149,245	161,639
Stone, sand and gravel:		
Dimension stone:		
Crude	11,182	16,818
Worked		201
Dolomite	24,124	43,920
Gravel and crushed rock	202,000	327,257
Quartz and quartzite	1,137	672
Sand ... thousand tons	1,038	1,165
Sulfur:		
Elemental:		
Other than colloidal	44,715	56,805
Colloidal		114
Sulfuric acid	NA	17
Talc, steatite, soapstone, and pyrophyllite	236	584
Other nonmetals n.e.s.:		
Crude	NA	727
Slag, dross and similar waste, not metal bearing, from iron and steel manufacture	NA	260
Oxides, hydroxides and peroxides of strontium, barium, or magnesium	NA	162
Building materials of asphalt, asbestos and fibre cement and unfired nonmetals n.e.s.	NA	93
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	249	168
Carbon black	2,373	1,424
Coal including briquets, all grades ... thousand tons	457	839
Coke and semicoke ... do	46	14
Peat	NA	376
Rare gases, helium and hydrogen	NA	3
Petroleum:		
Crude ... thousand 42-gallon barrels	[r] 16,757	10,590
Refinery products:		
Gasoline ... do	--	9
Kerosine ... do	(2)	(2)
Distillate fuel oil ... do	[r] 5,505	8,982
Residual fuel oil ... do	[r] 3,731	1,089
Lubricants ... do	[r] 1,027	963
Other:		
Nonlubricating oils, n.e.s ... do	NA	7
Liquefied petroleum gas ... do		582
Other ... do		38
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	54,748	58,809

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[r] Revised. NA Not available.

[1] Quantities not available; values for 1969 are: gem—$51,615, industrial—$115,866, powder—$37,594; corresponding values for 1970 are: gem—$105,658, industrial—$213,512, powder—$93,688.

[2] Less than ½ unit.

Source: Instituto Nacional de Estadistica y Censos. Comercio Exterior, Part III, 1969 and 1970.

COMMODITY REVIEW

METALS

Aluminum.—On August 30, 1971, the Argentine Government gave final approval to the award of a contract to ALUAR, S. A., for the construction and operation of an aluminum reduction plant at Puerto Madryn. ALUAR is a privately owned local firm that has strong commercial ties with several Italian companies, which are expected to furnish the technology and supply much of the equipment for the plant.

The contract calls for a reduction plant with a design capacity of 140,000 to 150,000 tons per year. Feedstock for the plant will be imported alumina, much of which will initially be obtained from Australia. The planned Futaleufu hydroelectric power project, located more than 500 kilometers to the west, is to provide the electric power supply vital to the plant's operation. Construction of the aluminum plant was scheduled for completion by yearend 1974.

Copper.—Fabricaciones Militares (FM), the Argentine Army's industrial agency, and Falconbridge Nickel Mines, Ltd., of Canada signed a copper exploration contract in 1971. This contract covers a 225-square-kilometer area in the vicinity of Campana Mahuida in Neuquén Province. This area was previously examined by a United Nations team, which estimated that the ores present graded from 0.7 to 1.86 percent copper. The principal stipulations of the Falconbridge contract follow:

1. Exploratory activity may continue for 5 years.
2. Falconbridge has 1 year following the end of the exploration period in which to exercise its option to develop the deposits.
3. If this option is exercised, the company has 2 years in which to present a plan for the integrated development of the deposits.
4. The deposits remain the property of FM, with operating rights held by Falconbridge for 35 years, with a 15-year extension available.
5. If Falconbridge proceeds with development, it will do so in partnership with FM and the Government of Neuquén Province. Initially, 10 percent of the joint venture's ownership is to be donated to each of the state partners who will each have an option to purchase an additional 20 percent. The state partners will also have the option to collectively purchase up to one-third of the project's output at a price equivalent to 90 percent of the London Metal Exchange copper price.
6. Falconbridge would be committed to supply domestic copper demand from its local production at the London Metal Exchange price, without tariff protection.

During 1971, Argentina-Cities Service Development Co. proved up a large body of disseminated porphyritic copper ore at Farallon Negro in Catamarca Province. Over 30 test holes were drilled in the process of evaluating this deposit. The ore reportedly runs from 0.5 to 1.5 percent copper and also contains molybdenum of possible commercial value. Total reserve figures were not available. Negotiations concerning a development and production contract between Cities Service and the owners of the deposit, Yacimientos Mineros Aguas de Dionisio (YMAD), Catamarca Province, and the University of Tucman were at an inconclusive stage at yearend.

Compañia Minera Aguilar, S. A., a subsidiary of St. Joe Minerals Corp. of the United States, recently released preliminary results of diamond drilling at its Pachon copper prospect in the high Andes area of Western San Juan Province. Forty-seven drill holes were completed, 26 of which were used in calculating a preliminary estimate of 80 million tons of 1.0 percent copper ore and an additional 60 million tons of ore averaging 0.65 percent copper. More drilling and other exploration work was planned in order to determine the possibility of the economic exploitation of the prospect.

Iron and Steel.—Hierro Patagonica de Sierra Grande, S. A., a company with majority interest assigned to FM, continued to push ahead with its plans to develop the Sierra Grande high-phosphorous iron ore deposits. Plans call for iron ore to be mined at Sierra Grande at a rate of 3.5 million tons per year. This ore is to be run through primary grinding and preconcentration plants at the mine site and then pumped in slurry form through a 30-kilometer pipeline to Punta Colorado on the Golfo San Matías. A pelletizing plant and marine loading facilities are to be constructed at Punta Colorado. Plans call for ore production to begin during 1974.

A project for the beneficiation of ore from what was described as a large iron ore deposit at Uchime in Salta Province was reportedly being examined by the Mineral de Technologia Industrial. A new company, Ferrochaco, S. A., was established for the purpose of developing the hematite-goethite ore deposit on Argentina's borders with Brazil and Paraguay.

During 1971, Dalmine Sederca, S. A., announced plans to expand its steel tube mill at Campana near Buenos Aires. Construction was in progress on a fifth blast furnace at the Zapla plant in Jujuy Province. This furnace is expected to double output at Zapla, which is owned by the Cruesot-Loire Group, to 200,000 tons per year by 1973.

Uranium.—The Comisión Nacional de Energía Atómica (CNEA), which is responsible for all uranium exploration and production but contracts a major portion of its work to private firms, requested tenders during 1971, for the development of uranium deposits at Huemul and Arroyo Seco in Mendoza Province. CNEA also announced that out of a total area of 487,000 square miles considered to offer uranium prospects, 56,000 square miles had been explored. As a result of this exploratory activity, reserves of 16,000 tons of U_3O_8 have been discovered.

Construction continued during 1971 on Argentina's first nuclear power station, a 319-megawatt plant at Atucha, about 95 kilometers northwest of Buenos Aires. This plant, which will have a single reactor fueled with natural uranium and use heavy water as a moderator and coolant was scheduled for completion during 1973.

In mid-1971, CNEA announced plans for the erection of a second nuclear powerplant. This 600-megawatt plant is to be located in Córdoba Province.

NONMETALS

Cement.—Six companies operated 39 kilns at 16 plants with a combined total rated annual capacity of approximately 7,353,000 tons in 1971. However, these facilities were operated at only about 70 percent of capacity during the first half of the year. Rated capacity by province was as follows in thousand tons per year:

Province	Capacity
Buenos Aires	4,605
Córdoba	1,307
Chubut	168
Entre Riós	146
Mendoza	368
Neuquén	200
Salta	234
San Juan	155
Santiago del Estero	170
Total	7,353

Calera Avellaneda, S.A., obtained a $5.5 million[2] loan during the first half of 1971 from the International Finance Corp. for use in connection with its planned $20 million expansion project. This project involves the expansion of Calera's cement facilities at Olavarria in Buenos Aires Province from its current capacity of 300,000 tons per year to 700,000 tons per year. In order to accomplish this expansion, a new plant is to be constructed adjacent to the company's existing plant and limestone quarry. The new plant will be independent of the existing plant except for workshops, laboratories, and crushing facilities. Expansion of the limestone quarry will be carried out in order to keep pace with the needs of the enlarged cement operations. Completion of this project was scheduled for late 1972.

During the latter part of 1971, Cia Sudamérica de Cemento Portland Juan Minetti e Hijos, S.A., announced plans for the construction of a new 400,000-ton-per-year cement plant.

Fluorspar.—All 1971 production of fluorspar was from small mills in Rio Negro and San Luis Provinces. However, plans were announced during the year for the establishment of two sizable new plants.

Kaiser Minera Argentina, S.A., a subsidiary of Kaiser Aluminum and Chemical Corp., announced its intention to construct a 100,000-ton-per-year sink flotation and heavy media separation plant at Puerto Madrin in Chubut Province. The final product of this plant is to be metallurgical-grade fluorspar, about 75 percent CaF_2.

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[2] Where necessary, values have been converted from Argentine pesos (M$N) to US dollars at the rate of M$N4.00=US$1.00.

Feedstock for the plant will be crude ore from small, independent mines, as well as the company's concessions in the Sierra Grande area of Rio Negro Province. Plant output will be available for use at the primary aluminum smelter planned for Puerto Madryn and for export.

In addition, Ducilo S.A.I.C., a subsidiary of The Dow Chemical Co., also indicated plans for the construction of a flotation plant in Chubut Province. The capacity of this mill would be dependent on the extent of the crude fluorspar reserves proved by extensive drilling programs in progress at two deposits in that province.

Sulfur.—A little over 60 percent of the country's sulfur requirements in 1971 were domestically produced by mining low-grade sulfur ore, which was beneficiated by autoclaving and flotation. The operation of the Establacimiento Azufrero Salta, controlled by FM, was the largest with an output of approximately 32,500 tons of sulfur during the year. The ore, averaging 25 percent sulfur, was mined high in the Andes Mountains, 18,700 feet above sea level, in Salta Province.

MINERAL FUELS

Coal and Coke.—Yacimientos Carboníferos Fiscales (YCF), the Government coal entity, announced plans to expand production at its Rio Turbio mine located in extreme southwestern Argentina in Santa Cruz Province. Output of raw coal is to be increased to 3 million tons annually within the next few years, and washed coal production is to be expanded to 1.5 million tons per year. This level of output would provide for essentially all of Argentina's domestic coal requirements.

Petroleum and Natural Gas.—Argentina's output of crude oil increased 8 percent to 422,000 barrels per day during 1971. Yacimientos Petrolíferos Fiscales (YPF), the Government oil entity, was responsible for 69 percent of total production and private companies, the most important of which were U.S. owned, holding contracts with YPF under terms provided in Hydrocarbons Law 17,319 of 1967, accounted for 30 percent. The remaining 1 percent of production was from private firms operating under earlier agreements.

Natural gas production increased approximately 6 percent to 785 million cubic feet per day in 1971. Of this total, 66 percent was sold to consumers, 14 percent represented producers fuel and shrinkage due to extraction of natural gas liquids, and 20 percent was flared. The quantity of gas injected for repressuring was insignificant.

According to figures published by YPF, the country's total proved reserves of crude oil were almost 2.5 billion barrels at the beginning of 1971. Natural gas reserves, as of the same date, were reported to be slightly more than 6 trillion cubic feet.

Geologic and geophysical surveying and exploratory and development drilling activities were as follows:

		1969	1970	1971
Geologic and geophysical surveying:				
Geologic	party months	100.0	112.0	NA
Gravimetric	do	12.0	14.0	NA
Magnetic	do	1.3	--	NA
Seismic	do	287.1	341.9	NA
Total	do	400.4	467.9	NA
Drilling: Wells drilled:				
Exploratory:				
Oil	number	16	14	NA
Gas	do	4	10	NA
Dry	do	66	89	NA
Subtotal	do	86	113	118
Development:				
Oil	do	228	334	NA
Gas	do	20	38	NA
Dry	do	88	94	NA
Subtotal	do	336	466	281
Total	do	422	579	399

NA Not available.

Three significant oil discovery wells were brought in by YPF during 1971. Two of these are in Neuquén Province, one in the Aguada San Roque Basin and the other in the extreme southern part of the Province. A third successful wildcat was the San Luis discovery well on the island of Tierra del Fuego in extreme southern Argentina.

Two onshore and seven offshore petroleum exploration blocks, which private foreign oil companies (mostly U.S.) had requested the Secretariat of Energy to make available for public bidding, were assigned to YPF by Decree 3287 of August 24, 1971. Included among these blocks was a large offshore area extending from Argentina's southern coast toward the Falkland Islands in which a consortium of U.S. firms had recently carried out geophysical studies.

During the latter part of 1971, YPF invited bids on exploration and development contracts covering eight blocks with a combined area of 44,000 square miles. The blocks involved are located off the coast of Tierra del Fuego, near the Caimaneito field in Jujuy Province, and onshore in the Golfo San Jorge area.

Companies awarded contracts will be required to pay all exploration costs. The initial exploration period will be 4 years with an option to extend for 5 years. All hydrocarbons produced are to be delivered to YPF, which offers to pay contractors a 50- to 75-percent median world price. This median is to be determined by taking a middle price of Kuwait, Venezuelan, and Gulf of Mexico Port (Houston) crude oil prices.

A government decision that YPF run its refineries at full capacity, leaving the residual balance of demand to be served by the privately owned refineries, became effective at the beginning of 1971. Consequently, all privately owned refinery improvement plans were suspended, and plant expansion activities were limited to YPF facilities.

Work was completed on the Luján de Cuyo refinery expansion project, which increased the plant's throughput capacity to 113,000 barrels per day. Among the principal facilities installed as a part of this project were a 57,000-barrel-per-day atmospheric distillation unit, a 53,600-barrel-per-day vacuum distillation unit, a 9,500-barrel-per-day catalytic reformer, and a 20,000-barrel-per-day Isomax unit. Facilities were also added for the production of hydrogen and the recovery of liquids from natural gas.

Other YPF refinery projects were in progress or in the planning stage at yearend. Work probably was in progress on the addition of a 75,000-barrel-per-day atmospheric distillation unit at the La Plata refinery. The most ambitious of the projects planned called for the construction of a new plant at Dock Sur, near Buenos Aires, adjacent to or in place of the small refinery now operating there. Other plans announced included modernization of the Plaza Huincul refinery and the addition of propane and naphtha recovery facilities at Campo Durán.

At yearend 1971, work was completed or nearing completion on a 270-kilometer crude oil line connecting the marine terminal under construction at Cabo San Antonio with refineries in La Plata and Buenos Aires. This 32-inch line is to have a capacity of 200,000 barrels per day. Construction continued on a 14-inch refined products pipeline from Mercedes, on the Luján de Cuyo-Córdoba line, to Buenos Aires. This 660-kilometer pipeline is to have a capacity of 50,000 barrels per day. Completion was scheduled for 1972.

Argentina's Government-owned gas distribution company, Gas del Estada, continued its natural gas transmission network expansion program during 1971. A 570-kilometer line from Neuquén to Bahía Blanca was completed or nearing completion at yearend. This has a diameter of 24 inches and a design capacity 130 million cubic feet per day. In addition, plans were completed for the construction of a natural gas pipeline linking the El Cóndor and Cerro Redondo fields, in extreme southern Argentina, with the southern terminus of the existing pipeline from Pico Truncado to Buenos Aires. Capacity of the 665-kilometer, 30-inch El Cóndor-Pico Truncado line will be 300 million cubic feet per day.

Gas del Estada also announced plans for the installation of a natural gas liquefaction plant and related liquefied natural gas (LNG) storage facilities at Dock Sur. This plant, which will obtain its natural gas via pipeline from southern Argentina, will increase the company's ability to satisfy peak demand in the Buenos Aires area during the cold season. A pier to be constructed adjacent to the plant's storage facilities will handle butane and propane shipments but will also be available for the unloading of LNG when and if the importation of this product becomes necessary.

During May 1971 Petroquimica General Mosconi, a firm owned jointly by FM and YPF, awarded a contract for the basic engineering of a planned petrochemical project adjacent to YPF's La Plata refinery to a group of three U.S. companies. This group included Hydrocarbon Research, Inc., Atlantic Richfield Co., and Englehard Metals and Chemicals Corp. Upon completion of the basic engineering studies later in the year, bids were invited for construction of the project, which was scheduled for completion by the end of 1974. The plant is to utilize raw materials from the La Plata refinery for the annual production of 28,000 tons of benzene, 5,000 tons of toluene, 40,000 tons of cyclohexane, 15,000 tons of orthoxylene, 33,000 tons of paraxylene, and 17,000 tons of aromatic mixtures.

During November 1971, Law 19,334 established Petroquimica Bahía Blanca, S.A.I.C., for the purpose of proceeding with the Bahía Blanca petrochemicals complex originally proposed by The Dow Chemical Co., which had been unable to reach agreement concerning FM's degree of participation in the project. YPF, Gas del Estado, and FM were each assigned a 17-percent interest in the new company. The remaining shares (49 percent) will be made available to private petrochemicals companies, and/or to private individuals through use of the stock market. FM will be in charge of contracting for all licences, engineering, supervision, and guarantees for the construction, testing, and start up of the complex. The site for the project will be acquired from The Dow Chemical Co. under terms remaining to be negotiated and The Dow Chemical Co. is expected to provide the required technology.

The Mineral Industry of Australia

By Charlie Wyche [1]

Australia's mineral industry continued its high level of production, development activity, and mineral exports in 1971. Production of almost all minerals moved upward and preliminary statistics for 1971 indicate the total value of minerals produced at $1.60 billion.[2] This figure represents an increase of approximately 11 percent over the previous record high of $1.42 billion recorded in 1970. The major portion of mineral output was exported, and mineral shipments accounted for 26 percent of the nation's total exports. There were substantial expansions in crude oil and natural gas production, resulting mainly from further development of the Bass Strait fields off Victoria. Crude oil output almost doubled to 113 million barrels, and production of natural gas was up 50 percent to 79 billion cubic feet. Other significant increases included bauxite, up 35 percent to 12.5 million tons; copper mine production, up 12 percent to 176,988 tons; manganese ore, up 40 percent to 1,050,253 tons; nickel concentrates, up 4 percent to 32,537 tons; tin and tungsten concentrates increased by 8 percent and 21 percent, respectively.

Following a period of continued expansion in the 1960's, growth in the mineral sands industry leveled out in 1971, and although zircon production reached a record high of over 400,000 tons, production of both rutile and ilmenite concentrates were marginally less than in 1970. Only lead, and zinc production recorded significant declines in 1971.

Mineral exports continued to expand, and in 1971 export values increased to a record $1.3 billion, an increase of about 12 percent compared with 1970 figures. Iron ore and pellets, bauxite and alumina, coal, and manganese ore, were mainly responsible for the increase. In contrast, the value of mineral imports decreased to $208 million, a drop of about 27 percent compared with 1970 figures. Increased domestic production of petroleum products was the principal cause for the decline in value of mineral imports. Imports of crude oil alone, decreased from about $162 million in 1970 to about $118 million in 1971. Imports of fertilizer materials—phosphate rock, potash, and sulfur—declined from $35 million in 1970 to $30 million in 1971 and reflects reduced activity in the rural sector of the economy.

Recent discoveries of large resources of various minerals in Australia opened new prospects for growth and development. Deposits of iron ore and bauxite are perhaps the largest in the world, while coal, nickel, uranium, mineral sands, and very recent discoveries of natural gas are also of great importance. Iron ore and nickel were found in Western Australia; bauxite was found in northern Queensland and the Northern Territory; natural gas was found in the Bass Strait, and in South Australia. Western Mining Corp. Ltd. (WMC) announced location of extensive uranium mineralization in Western Australia. The deposit is located at Yeelirrie, about 50 miles southwest of Wilna.

PRODUCTION

Although the total value of Australia's minerals established an alltime record in 1971, the year's output of many individual commodities, particularly metals, was below the 1970 volume. Voluntary cutbacks by the principal producers of lead, ilmenite concentrates, silver, and zinc resulting from a decline in world demand were responsible for the downward trend in output. Output of nonmetals increased both in quantity and value.

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[1] Physical scientist, Division of Nonferrous Metals.

[2] Unless otherwise indicated, values have been converted from Australian dollars (A$) to U.S. dollars at the rate of A$1=US$1.14.

Table 1.—Australia: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971 [p]
METALS			
Aluminum:			
Bauxite, gross weight……thousand tons	7,921	9,256	12,541
Alumina……do	1,931	2,152	2,671
Metal, refined……do	126	206	223
Antimony, mine output (content of antimony and lead concentrates)	925	930	1,125
Beryllium, beryl, gross weight	7	18	71
Bismuth, mine output (content of ore)……kilograms	200,127	191,465	243,786
Cadmium:			
Mine output, metal content	1,687	1,639	1,483
Smelter output (refined)	571	614	559
Cobalt, mine output (content of zinc and nickel concentrates)	244	469	311
Columbium-tantalum concentrates, gross weight	155	101	75
Copper:			
Mine output, metal content	131,056	157,790	176,988
Blister:			
Primary	116,184	111,652	143,249
Secondary	8,242	8,718	NA
Refined:			
Primary	100,854	104,125	120,223
Secondary	19,552	20,517	NA
Gold:			
Mine output, metal content……troy ounces	[r] 701,895	619,922	672,106
Refined (excluding recovery from scrap)……do	703,353	604,795	598,201
Iron and steel:			
Iron ore, gross weight [1]……thousand tons	[r] 38,576	51,188	62,100
Pig iron……do	[r] 6,107	6,148	6,128
Ferroalloys:[2]			
Ferrochromium, high carbon	2,447	2,169	2,100
Ferromanganese	50,249	42,569	42,500
Ferrosilicon	9,533	9,406	9,400
Silicomanganese	16,293	23,188	23,100
Ferronickel	19	1,357	1,300
Total	78,541	78,689	[e] 78,400
Crude steel……thousand tons	[r] 7,016	6,822	6,736
Steel semimanufactures [2]……do	[r] 6,033	6,217	NA
Lead:			
Mine output, metal content	452,040	456,743	402,687
Metal:			
Primary:			
Bullion for export	155,592	170,941	160,387
Refined	188,756	180,078	163,234
Total	344,348	351,019	323,621
Secondary (excluding remelt)	26,100	25,900	NA
Manganese ore, gross weight	889,289	751,113	1,050,253
Mercury……76-pound flasks	48	37	9
Molybdenum, mine output, metal content	47	59	[e] 60
Monazite concentrate, gross weight	3,855	4,437	4,404
Nickel:			
Mine output, metal content	11,181	29,765	32,537
Metal, refined	--	[e] 9,000	[e] 15,000
Platinum-group metals:			
Osmiridium……troy ounces	--	[3] 1,643	[e][4] 1,400
Palladium……do	[3] 321		
Platinum……do	[3] 473		
Selenium (in refinery slimes)[e]……kilograms	3,000	3,300	3,300
Silver:			
Mine output, metal content……thousand troy ounces	24,457	25,992	21,703
Refined……do	[r] 10,586	9,422	8,453
Tin:			
Mine output, metal content……long tons	[r] 8,177	8,689	9,639
Smelter output……do	4,156	5,129	6,233
Titanium concentrates:			
Ilmenite	712,426	886,452	814,842
Leucoxene	8,098	10,593	14,433
Rutile	362,058	370,867	366,726
Tungsten, mine output, metal content	[r] 1,385	1,265	1,547
Uranium oxide (U_3O_8) [e]	300	300	300
Zinc:			
Mine output, metal content	509,903	487,207	450,297
Smelter output	246,323	260,591	258,698
Zircon concentrates, gross weight	375,223	395,352	405,856
NONMETALS			
Abrasives, natural:			
Beach pebbles	1,062	1,688	NA
Garnet (sales)	83	202	NA
Asbestos	[r] 838	828	1,006
Barite	40,197	42,813	27,357
Cement, hydraulic……thousand tons	4,310	4,599	4,721

See footnotes at end of table.

Table 1.—Australia: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971 [p]
NONMETALS—Continued			
Clays:			
Bentonite and bentonitic	463	358	[e] 360
Brick and shale ... thousand tons	7,932	6,806	7,532
Cement and shale ... do	277	300	[e] 300
Damourite (sales)	[r] 553	417	[e] 400
Fire ... thousand tons	325	319	[e] 320
Kaolin and ball	65,484	89,577	[e] 90,000
Other ... thousand tons	628	774	NA
Diatomite	2,412	2,656	1,392
Feldspar	5,016	3,535	3,644
Fertilizer materials, crude, phosphate rock	18,551	14,489	[e] 15,000
Fluorspar	--	1,266	464
Fuller's earth	30	--	--
Gem stones [e] ... value, thousands	$13,900	$17,325	NA
Gypsum	912,113	845,444	895,254
Kyanite and sillimanite (sillimanite only produced)	1,701	1,183	856
Lime [e] [5]	210,000	210,000	230,000
Lithium minerals, petalite, gross weight	721	783	1,674
Magnesite	23,525	22,461	18,092
Perlite, crude	1,132	838	NA
Pigments, natural mineral, ocher	678	660	NA
Pyrite including cupreous:			
Gross weight	160,931	213,701	259,080
Sulfur content	71,789	103,039	123,478
Salt ... thousand tons	1,680	3,070	[e] 3,100
Sand and gravel:			
Construction sand ... do	18,199	16,973	NA
Glass sand including quartzite ... do	652	NA	NA
Gravel ... do	10,501	12,093	NA
Stone:			
Dolomite ... do	297	328	355
Limestone for cement ... do	6,500	6,853	NA
Limestone for other uses ... do	3,108	3,143	NA
Other:			
Crushed and broken [6] ... do	[r] 47,830	46,311	NA
Dimension [6] ... do	269	219	NA
Unspecified [7] ... do	24,695	28,594	NA
Sulfur, byproduct [8]	135	146	[e] 140
Talc, soapstone, and pyrophyllite	[r] 55,425	128,143	56,414
MINERAL FUELS AND RELATED MATERIALS			
Coal:			
Bituminous [9] ... thousand tons	46,082	49,211	48,899
Lignite ... do	23,274	24,175	23,382
Total ... do	69,356	73,386	72,281
Coke:			
Metallurgical ... do	[r] 3,848	4,298	4,405
Gas house (including breeze) ... do	391	236	[e] 200
Fuel briquets ... do	1,487	1,449	1,476
Gas, natural, marketable production ... million cubic feet	9,375	53,061	79,049
Natural gas liquids [10] ... thousand 42-gallon barrels	NA	478	NA
Petroleum:			
Crude ... do	[r] 15,765	65,149	112,914
Refinery products:			
Aviation gasoline ... do	219	246	407
Other gasoline ... do	58,721	62,255	65,626
Jet fuel ... do	6,764	8,753	10,254
Kerosine ... do	1,710	1,676	1,784
Distillate fuel oil ... do	[r] 31,832	34,043	37,598
Residual fuel oil ... do	38,913	41,597	36,567
Lubricants ... do	2,258	2,576	2,929
Other ... do	[r] 12,759	12,876	15,105
Refinery fuel and losses ... do	[r] 12,761	15,438	15,214
Total ... do	[r] 165,937	179,460	185,484

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] Excluding iron oxide for use in cement production, coal washing and gas purification; output of such material totaled 43,276 tons in 1969 and 60,783 tons in 1970 (1971 data not available).

[2] Data are for year ended November 30 of that stated.

[3] Partial data; figures represent actual smelter/refinery recovery from nickel concentrates exported to Japan from Kambalda. Additional quantities of palladium and platinum are present in Kambalda concentrates produced for domestic smelting and for export to Canada for smelting, but platinum-group metals reportedly are not recovered from domestically smelted minerals, and the quantity recovered in Canada (if any) is not reported.

[4] Estimate of material recovered in Japan only (see footnote 3).

[5] Data are for year ended June 30 of that stated.

[6] Excludes quartzite (see under sand and gravel) and all production from Northern Territory and Australia Capital Territory.

[7] Excludes quartzite (see under sand and gravel) and all production from Northern Territory, Australian Capital Territory, South Australia and West Australia.

[8] Sulfur content of sulfuric acid produced as a byproduct of oil refining and nonferrous metal operations (excludes sulfur content of pyrite).

[9] Includes semianthracite and subbituminous.

[10] Output of Barracouta and Marlin offshore platforms only.

TRADE

The following trade data, provided by the Commonwealth Bureau of Census and Statistics, cover the official July 1 to June 30 annual reporting period; therefore, the data are not comparable with calendar year data presented elsewhere in this review:

Table 2.—Australia: Exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1968–69	1969–70	Principal destinations 1969–70
METALS			
Aluminum:			
Bauxite, gross weight thousand tons	2,682	3,750	Japan 1,845; West Germany 1,143 France 330.
Alumina, gross weight [2] do	1,489	1,584	United States 1,075; Japan 344; Canada 165.
Metal:			
Scrap	3,219	2,718	Japan 1,634; West Germany 466; Netherlands 454.
Unwrought	8,522	50,521	Japan 32,131; United Kingdom 4,986; Hong Kong 3,965.
Semimanufactures [3]	3,729	2,955	New Zealand 880; Japan 585; Malaysia 549.
Beryllium ore and concentrate	129	25	All to United States.
Cadmium metal, refined	128	25	Netherlands 8; United States 8.
Columbium and tantalum, tantalite-columbite concentrates, gross weight	1,092	108	United Kingdom 101.
Copper:			
Ore and concentrate, gross weight	41,732	65,111	Japan 61,201.
Metal:			
Scrap	362	136	Belgium-Luxembourg 91.
Unwrought:			
Blister and cement	7,936	8,140	Japan 8,029.
Other	26,476	38,677	United Kingdom 12,919; Japan 5,989; West Germany 5,716; France 5,343.
Semimanufactures [3]	[r] 10,290	10,926	New Zealand 7,658; Malaysia 1,089.
Gold:			
Ore and concentrate, metal content [2] troy ounces	[r] 597,089	188,441	Hong Kong 183,818; New Zealand: 4,344.
Mint bullion do	50,869	146,795	All to Singapore.
Sheet, strip and dust do	644,307	828,788	Hong Kong 819,735; New Zealand 5,736.
Iron and steel:			
Iron ore and concentrate thousand tons	20,394	33,778	Japan 29,366; West Germany 809; Italy 670.
Scrap do	490	529	Japan 488; People's Republic of China 13.
Pig iron do	352	290	Japan 247; Philippines 15.
Steel ingots and other primary forms [3] do	432	451	Philippines 244; Hong Kong 57; United Kingdom 55.
Steel semimanufactures do	699	706	New Zealand 227; United States 87; Indonesia 33; Papua New Guinea 31.
Lead:			
Ore and concentrate, gross weight	115,162	121,385	United States 49,808; Japan 27,418; United Kingdom 22,541.
Metal:			
Unwrought:			
Bullion lead-silver, lead content	128,375	169,755	United Kingdom 146,442; Netherlands 17,215.
Refined	117,267	162,919	United Kingdom 63,996; United States 58,417.
Semimanufactures	6,616	8,230	New Zealand 2,983; United Kingdom 1,801; Philippines 929.
Manganese ore, gross weight	639,635	648,936	Japan 476,147; Netherlands 57,314; United States 53,906.
Platinum-group metals [3] troy ounces	8,486	6,245	Hong Kong 3,526; United Kingdom 1,815; Singapore 407.
Rare-earth metals, monazite concentrate [2]	2,724	5,020	United States 2,523; Netherlands 1,218; France 978.
Silver:			
Concentrates and lead-silver bullion, silver content [2] thousand troy ounces	[r] 13,124	15,410	NA.
Mint bullion do	10,718	7,503	United Kingdom 4,400; Japan 2,863; Singapore 238.
Sheet, strip and dust do	948	611	Singapore 427; New Zealand 103; West Germany 81.

See footnotes at end of table.

Table 2.—Australia: Exports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1968-69	1969-70	Principal destinations 1969-70
METALS—Continued			
Tin:			
Ore and concentrate, gross weight long tons	6,387	7,002	Netherlands 2,898; Spain 1,886; United Kingdom 1,284.
Metal, unwrought do	434	553	Japan 280; United States 140; New Zealand 92.
Titanium concentrates, gross weight:			
Ilmenite, minimum 45 percent TiO_2	503,179	596,216	United Kingdom 211,178; Japan 177,672; France 87,582.
Rutile, minimum 90 percent TiO_2	290,672	346,436	United States 175,361; United Kingdom 39,095; Japan 30,922.
Tungsten concentrates, gross weight:			
Scheelite	1,799	1,431	United Kingdom 802; West Germany 372.
Wolframite	690	995	Netherlands 412; West Germany 294.
Zinc:			
Ore and concentrate, gross weight	337,958	437,121	United Kingdom 199,281; Japan 161,067.
Metal:			
Scrap and dust [3]	2,739	2,393	United Kingdom 539; Bahrain 336; Japan 316.
Unwrought	117,416	154,716	United States 27,733; United Kingdom 18,576; New Zealand 14,759; People's Republic of China 14,225.
Semimanufactures [3]	1,321	1,085	Pakistan 320; New Zealand 290; Hong Kong 174.
Zircon concentrates, gross weight, minimum 30 percent $ZrSiO_4$ [3]	300,740	351,101	Japan 111,084; United States 75,532; France 31,804; United Kingdom 27,781; Italy 26,249.
NONMETALS			
Abrasives, crude natural value, thousands	$17	$55	Philippines $31; Japan $12.
Asbestos, crude and fiber [4]	410	551	Indonesia 245; New Zealand 168; Malaysia 136.
Cement, hydraulic [3]	1,638	10,273	New Caledonia 5,415; Papua New Guinea 3,050.
Clays, fireclay and other, including sillimanite [3]	5,266	6,279	Japan 2,385; United Kingdom 2,253.
Diamond:			
Gem [3] carats	1,711	2,094	Belgium-Luxembourg 968; Israel 369.
Industrial [3] do	76,219	83,411	United States 46,612; United Kingdom 28,039.
Gem stones, except diamond:			
Opal [3] value, thousands	$9,561	$9,498	Hong Kong $4,327; Japan $2,728; United States $1,040.
Other (cameo, intaglio) [3] do	$3,748	$4,260	United States $1,374; Japan $1,121; Hong Kong $669.
Gypsum	267,889	205,718	New Zealand 103,364; Taiwan 42,743; Philippines 33,540.
Magnesite	2,006	951	New Zealand 431; United States 370.
Salt	300,689	1,304,078	Japan 1,303,036; Papua New Guinea 411.
Talc and steatite [3]	21,013	39,221	Netherlands 19,898; Japan 17,261.
MINERAL FUELS AND RELATED MATERIALS			
Coal thousand tons	14,021	17,623	Japan 16,521; West Germany 526.
Coke and semicoke do	149	455	New Caledonia 146; Japan 139; Peru 104;
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	[r] 1,729	1,304	Singapore 780; New Zealand 437; Territory of South-West Africa 53.
Jet fuel and kerosine do	[r] 560	1,041	Singapore 619; New Zealand 400.
Distillate fuel oil do	[r] 1,381	1,926	Singapore 820; New Zealand 658; Territory of South-West Africa 120.
Residual fuel oil do	[r] 2,022	2,966	Singapore 1,995; New Caledonia 483; Fiji 238.
Lubricants do	720	673	Republic of South Africa 174; New Zealand 172; Singapore 57.
Other products do	262	349	New Zealand 308.

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[r] Revised. NA Not available.

[1] Data are for years beginning July 1 unless otherwise specified.

[2] Data given are for years beginning January 1; in the cases of bauxite and alumina, figures are receipts by trading partner countries.

[3] Includes reexports.

[4] Mostly crocidolite.

Table 3.—Australia: Imports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1968–69	1969–70	Principal sources, 1969–70
METALS			
Aluminum metal:			
Scrap	845	856	New Zealand 682; Canada 90; Fiji 72.
Unwrought	11,847	1,073	United Kingdom 510; United States 410; France 135.
Semimanufactures	[2] 4,459	3,228	United States 1,081; West Germany 735; United Kingdom 711.
Antimony metal, all forms	30	66	People's Republic of China 62; United Kingdom 4.
Arsenic trioxide	1,022	1,237	Sweden 706; France 287; People's Republic of China 230.
Bismuth metal, all forms	10	14	United Kingdom 11; Republic of Korea (South) 3.
Chromium, ore and concentrate, gross weight	18,771	10,576	Philippines 10,355.
Cobalt and cobalt base alloys	123	96	Zambia 63; Zaire 14; Belgium-Luxembourg 11.
Copper:			
Ore and concentrate	(3)	5	NA.
Metal:			
Scrap	1,242	1,328	New Zealand 888; Malaysia 135; Papua New Guinea 124.
Unwrought	105	44	United States 25; West Germany 10; New Zealand 8.
Semimanufactures	[r] 1,896	2,172	United Kingdom 1,239; Japan 537; United States 171.
Gold:			
Crude bullion, gold content troy ounces	109,108	134,015	Fiji 108,896; Papua New Guinea 25,076.
Refined bullion do	4,211	62,229	United Kingdom 61,347; West Germany 492.
Iron and steel:			
Ore and concentrate, including roasted pyrite	117,940	181	NA.
Scrap	138	1,556	New Zealand 639; Japan 439; Canada 400.
Ferroalloys:			
Ferrochromium	3,553	9,607	Republic of South Africa 5,445; Finland 2,557.
Ferromanganese	10,159	6,698	Republic of South Africa 3,424; Japan 2,556.
Ferromolybdenum	87	247	United States 134; United Kingdom 96.
Ferrosilicon	6,871	9,277	Republic of South Africa 4,037; India 1,748; Canada 1,243.
Ferronickel	518	2,884	New Caledonia 1,503; Greece 1,159.
Other	2,116	2,523	France 781; Republic of South Africa 571; Japan 491; Sweden 446.
Steel, primary forms	11,794	16,699	Japan 16,507.
Semimanufactures	[r] 437,884	346,474	Japan 240,982; United Kingdom 43,646; United States 16,545.
Lead metal and alloys, all forms	127	321	New Zealand 277.
Magnesium metal and alloys, all forms	1,025	1,602	United States 1,236; Norway 183.
Manganese ore and concentrates:			
Battery grade	635	3,028	All from Ghana.
Metallurgical grade	6,324	5,213	People's Republic of China 3,485; Republic of South Africa 1,689.
Mercury 76-pound flasks	1,013	1,012	United States 355; Mexico 244; Spain 189; Italy 130.
Nickel:			
Matte and similar materials	594	682	All from Canada.
Metal:			
Unwrought	1,668	1,360	Canada 1,162; United Kingdom 88; U.S.S.R. 51.
Semimanufactures	346	227	U.S.S.R. 72; Canada 67; United Kingdom 51.
Platinum-group metals troy ounces	25,999	14,484	United Kingdom 8,953; United States 2,745; U.S.S.R. 1,431.
Silicon metal value, thousands	$700	$696	Yugoslavia $199; Sweden $185; Italy $123.
Silver, crude bullion, silver content troy ounces	113,118	[4] 93,953	Fiji 35,355; New Zealand 21,585; United States 18,293; Papua New Guinea 14,721.
Tin, metal and alloys, all forms long tons	145	103	Mainly from Malaysia.
Tungsten metal and alloys, all forms	13	12	West Germany 5; United Kingdom 5; Canada 2.
Zinc:			
Ore and concentrate	3,303	--	
Metal and alloys, all forms	24	108	United Kingdom 106.

See footnotes at end of table.

Table 3.—Australia: Imports of mineral commodities[1]—Continued

(Metric tons unless otherwise specified)

Commodity	1968–69	1969–70	Principal sources, 1969–70
NONMETALS			
Abrasives, natural, pumice and tripoli	1,555	[5]1,465	United States 649; New Zealand 468.
Asbestos:			
Chrysotile	42,995	46,160	Canada 45,772.
Amosite	8,557	8,405	Republic of South Africa 8,347.
Other	2,845	2,669	Canada 1,969; Republic of South Africa 638.
Barite and witherite, natural and ground	2,119	2,159	People's Republic of China 1,800.
Boron minerals, crude and concentrate	1,428	1,753	United States 1,751.
Cement, hydraulic	77,527	85,220	Japan 51,551; United Kingdom 13,131; Okinawa 9,630.
Clays:			
Bentonite	53,753	68,699	United States 65,758; New Zealand 2,250.
China, kaolin and pottery	25,910	33,686	United Kingdom 21,710; United States 11,903.
Fire and ball	24,416	23,849	United Kingdom 15,052; United States 6,234.
Other	10,767	18,772	United States 15,724; Republic of South Africa 2,509.
Diamond:			
Gem carats	35,526	33,826	Belgium-Luxembourg 11,651; Israel 8,802; Republic of South Africa 6,642.
Industrial	702,830	964,984	Republic of South Africa 451,855; Netherlands 260,556; United Kingdom 80,524.
Diatomite and other earths	6,192	8,227	United States 6,439; United Kingdom 1,594.
Fertilizer materials:			
Crude:			
Nitrogenous (sodium nitrate)	3,907	4,588	All from Chile.
Phosphatic, phosphate rock thousand tons	3,228	2,692	Nauru 1,480; Christmas Island 794; Gilbert and Ellis Islands 317.
Manufactured:			
Nitrogenous	113,431	33,491	Japan 13,309; Canada 11,522; West Germany 3,463.
Phosphatic	14,246	1,649	All from Japan.
Potassic	137,098	135,274	United States 75,061; Canada 48,527; West Germany 5,226.
Mixed and other	66,485	25,489	United States 7,564; West Germany 6,714; Philippines 5,520.
Fluorspar and cryolite:			
Fluorspar	20,992	20,183	Republic of South Africa 12,413; United Kingdom 6,575.
Cryolite, natural and synthetic	225	269	Denmark 253.
Gem stones (except diamond) pearls and other precious and semiprecious value, thousands	$2,550	$2,323	Thailand $228; Japan $225; Papua New Guinea $223; West Germany $208; India $193. (Total includes $504 of materials of Australian origin that were reimported from unspecified countries.)
Gypsum, crude and calcined	1,072	964	United Kingdom 516; United States 240.
Graphite, natural	1,769	1,503	Ceylon 397; People's Republic of China 301; Malagasy Republic 206.
Kyanite and sillimanite:			
Kyanite	2,151	4,430	India 3,830; United States 597.
Sillimanite	709	9	NA.
Magnesite, crude, calcined and fused	20,607	12,829	Japan 12,654.
Mica:			
Block and/or sheet	12	10	Mainly from India.
Splittings	95	79	All from India.
Ground and scrap	745	797	Republic of South Africa 460; India 190.
Pigments, mineral, iron oxide	8,447	10,303	West Germany 6,211; Spain 2,013; United Kingdom 833.
Salt	7,503	8,251	United Kingdom 7,950.
Stone:			
Limestone	522,612	471,101	All from Japan.
Quartz and quartzite	624	785	Sweden 559.
Construction, n.e.s	NA	3,910	Italy 2,103; Republic of South Africa 907; Finland 435.
Sulfur, elemental	401,326	434,162	Canada 278,527; Mexico 87,242.
Talc, steatite and chalk	10,489	11,120	France 6,390; United Kingdom 1,748; India 1,256.
Vermiculite	3,598	3,763	Republic of South Africa 3,701.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	658	1,134	Trinidad and Tobago 600; United States 504.
Carbon black and gas carbon	3,501	3,705	United States 3,249; United Kingdom 353.
Coal, all types including briquets	19,931	10,503	Republic of South Africa 8,116; United States 2,354.
Coke and semicoke	72,573	88,370	United States 76,077; United Kingdom 12,080.

See footnotes at end of table.

Table 3.—Australia: Imports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1968–69	1969–70	Principal sources, 1969–70
MINERAL FUELS AND RELATED MATERIALS—Continued			
Peat	3,175	3,705	West Germany 2,436; Ireland 978.
Petroleum:			
Crude..thousand 42-gallon barrels	147,762	145,596	Kuwait 34,661; Saudi Arabia 29,777; Indonesia 28,994; Qatar 14,942.
Refinery products:			
Gasoline do	2,496	4,149	Bahrain 1,904; Iran 809; South Yemen 747.
Jet fuel and kerosine do	837	1,003	Singapore 438; Southern Yemen 169; Bahrain 152.
Distillate fuel oil do	1,555	2,162	Singapore 1,040; Bahrain 453; Saudi Arabia 285.
Residual fuel oil do	[r] 3,952	7,598	Kuwait 3,002; Southern Yemen 1,576; Iran 1,148; Singapore 1,139.
Lubricants do	396	256	United States 145; Netherlands Antilles 51; United Kingdom 49.
Liquefied petroleum gas do	2	2	Mainly from United States.
Bitumen do	31	12	Singapore 11.
Other do	[r] 1,972	2,597	Bahrain 2,221.

[r] Revised. NA Not available.

[1] Data are for years beginning July 1.

[2] In previous editions, a portion of this quantity was reported separately under a heading of "Pipes, tubes, powder, and wire" ("Pipes, tubes, castings and forgings" in the case of iron and steel).

[3] Less than ½ unit.

[4] Includes refined bullion.

[5] Includes emery and natural corundum.

COMMODITY REVIEW

METALS

Aluminum.—New production records were set in all areas of Australia's aluminum industry in 1971. Primary aluminum production increased about 8.2 percent over the 1970 output. Expanded capacity at Bell Bay by Comalco Industry Pty., Ltd. was the chief cause for the increase. Alcan Australia, Ltd., completed the expansion of its Kurri Kurri smelter to 50,000 tons in 1971, and output increased steadily during the year. Production by Alcoa of Australia (Western Australia) N.L. at Point Henry was consistently ahead of rated capacity. Alumina production of 2.7 million tons was about 24 percent more than in 1970, and reflected full-capacity operation of the newly expanded refineries at Gladstone and Kwinana. Bauxite production at Weipa and Jarrahdale was well ahead of its 1970 level, in line with increased requirements for alumina production.

Bauxite production and shipments by Comalco, at Weipa on the Cape York Peninsula, Queensland, increased sharply and totaled about 7.3 million tons during 1971. A major expansion of mining, beneficiation, shipping and townsite facilities was nearing completion. This will lift annual capacity to 10.7 million tons. Comalco continued discussions with numerous companies concerning the formation of a consortium to construct a large aluminum refinery at Weipa. The Queensland Alumina Ltd. plant at Gladstone, Queensland, which receives all the bauxite from Weipa, became the world's largest alumina plant with completion of the second phase of its expansion in June. Annual production was set at 1.3 million tons, but the plant has consistently operated above the rated capacity.

For the first time bauxite was shipped from Gove in the Northern Territory where Nabalco Pty. Ltd. is completing the first stage of an alumina plant with an annual capacity of 508,000 metric tons. Mining operations are carried out by Nabalco, a joint Australian-Swiss Co. with a 70-percent interest held by Swiss Aluminium Ltd. and 30 percent by eight large Australian companies. This plant will become fully operational in 1972, and it is planned to double capacity to 1 million tons by 1973. Nearly all raw bauxite exports will go to Japan, while alumina exports will go to Swiss Aluminium's smelters in Europe.

Amax Pacific Aluminum through its subsidiary, Kimberley Alumina Pty. Ltd., is the manager of a project to mine bauxite in the North Kimberley District of Western Australia and to produce alumina at Port Warrender on the Admiralty Gulf.

The alumina plant to be completed late in 1974 will have an initial annual capacity of over 1 million tons. Participation in the international consortium supporting the project at yearend included American Metal Climax, Inc. (AMAX), Holland Aluminium N.V., and four Japanese companies. Estimates of the capital costs of the venture ranged from $330 to $390 million.

Alwest Pty. Ltd., a subsidiary of News, Ltd., reported that it had proved bauxite reserves in the Darling Range of 200 million tons averaging 32 percent alumina. The company was studying the feasibility of building an alumina plant near Bunbury, Western Australia, in a joint venture with Broken Hill Pty. Co. Ltd.

Tipperary Land and Exploration Corp., which is associated with Holland Aluminium and Péchiney in a project to develop bauxite deposits in the Aurukun area south of Weipa, Queensland, reported that it had reserves of 600 million tons containing 50 percent alumina. The feasibility of constructing and financing a large alumina plant was being investigated. Near Weipa, Austral-Pacific Mining Corp., Ltd., and Secmin, Ltd., in a joint venture, reported confirmation of commercial-grade bauxite in two areas.

Alcoa continued to mine bauxite in the Jarrahdale area of the Darling Range and to produce alumina at its plant at Kwinana. Construction of Alcoa's second alumina plant in Western Australia, located at Pinjarra, was expected to be completed by the middle of 1972. The initial capacity of this plant was reduced from a previously reported 500,000 tons per year to 417,000 tons. It will receive bauxite from another deposit in the Darling Range.

Copper.—Again in 1971 mine output and smelter production of blister and refined copper set new records. According to preliminary statistics, mine production increased 12 percent and production of primary blister copper was 28 percent above the 1970 level. These increases were mainly due to a record output at Mount Isa Mines, Ltd., in Queensland and a marginal increase in production at Mount Lyell Mining and Railway Co., Ltd., in western Tasmania. Output by those companies more than compensated for the sharp drop in production at Cobar Mines Pty. Ltd. in New South Wales, resulting from a 2-month strike and the cessation of mining at Ravensthorpe early in 1971.

The major copper producers and quantities of their output in 1968, 1969, and 1970 were reported in table 4.

During the year ending June 30, 1971, Mount Isa Mines, Ltd., treated 3.9 million tons of copper ores containing 3.1 percent copper. Output of blister copper during the period was a record 143,249 tons, due to increased concentrate availability and improved smelting performance. The company's refinery at Townsville was expanded to produce 150,000 tons of copper per year. An extensive exploratory drilling program revealed 10 million tons of additional ore, increasing reserves to 130 million tons averaging 3.0 percent copper.

Table 4.—Australia: Major copper industry facilities

Facility	Production (metric tons of copper [1])		
	1968	1969	1970
Mines:			
Mount Isa Mines, Ltd	60,729	78,229	84,225
Mount Morgan Ltd	8,070	8,189	87,106
Broken Hill field	3,346	3,752	3,644
Cobar Mines Pty. Ltd	8,953	11,351	8,313
Mount Lyell Mining and Railway Co., Ltd	16,371	16,615	16,720
Electrolytic Zinc Co. of Australasia Ltd	1,743	1,790	1,674
Ravensthorpe Copper Mines, N.L	749	786	533
Tennant Creek field	7,749	6,608	5,482
Rum Jungle field	189	140	120
Smelters:			
Mount Isa Mines, Ltd	62,943	80,490	81,663
Mount Morgan Ltd	7,301	8,132	8,034
Electrolytic Refining and Smelting Co. of Australia Pty. Ltd.[2]	10,213	13,689	9,315
Mount Lyell Mining and Railway Co., Ltd	13,481	13,872	13,925
Refineries:			
Mount Isa Mines, Ltd	64,519	77,380	80,521
Electrolytic Refining and Smelting Co. of Australia Pty. Ltd	21,102	23,474	21,959

[1] Metal content of ore for mines; primary blister copper for smelters; and primary electrolytic for refineries.

[2] Treats concentrates from Cobar Mines Pty. Ltd.

Cobar Mines Pty. Ltd., principal producer in New South Wales, extracted and treated 623,409 tons of copper and copper-zinc ores during the year ending June 30, 1971. The average grade of ore mined was 2.0 percent copper. A total of 41,707 tons of copper concentrate averaging 23.8 percent copper was produced. Concentrates were shipped to Port Kembla for smelting and refining.

Mount Lyell Mining and Railway Co., Ltd. at Queenstown, Tasmania, treated 2.3 million tons of 1 percent copper ore and produced a record of 82,073 tons of copper concentrate. The proportion of ore mined underground also increased from 11.6 percent last year to 28 percent during the year. Recovery of copper in concentrates at 88.8 percent was less than in the previous year due to the wide variation of head grade and rock types of material produced from development workings in different ore bodies. Shipments of the copper concentrates to smelters at Port Kembla and Japan were made on a regular basis. Proved ore reserves on June 30, 1971, were reported at 37.3 million metric tons with an average content of 1.42 percent copper. Underground development of new mines has continued satisfactorily. Other improvements to surface works such as rebuilding part of the railway system and the installation of new storage and handling facilities were all successfully completed.

Development at the $400 million Bougainville Copper Pty. Ltd., a subsidiary of Conzinc Riotinto of Australia Ltd. (CRA) project on Bougainville Island was near completion. Testing of equipment and preproduction stripping of the low-grade ore body at Panguna is proceeding on schedule. Production is slated for April 1972 at a rate of 90,000 tons per day of ore. Annual output of 150,000 tons per year of contained copper and of 500,000 ounces of gold is planned. Ore reserves available for open pit mining have been estimated at 920 million tons with an average grade of 0.48 percent copper and 0.36 pennyweight gold.

Directors of Mount Gunson Mining Pty., Ltd., owned 66⅔ percent by C.S.R. Co. Pty. Ltd. and 33⅓ percent by United Uranium N.L., suspended mining operations in December and placed their plant on a care and maintenance basis. The mine has not been as profitable as expected because of the sharp fall in the price of copper, lower ore grades, and seasonal water supply problems. Ore reserves have been reported at 3.3 million tons with an average grade of 1.04 percent copper and 0.35 ounce per ton of silver.

Gold.—Production of gold totaled 672,106 ounces, an increase of 8 percent above the levels of 1970. Grade of ore mined was higher, recovery being 4.12 deadweight per ton as compared with 4.03 deadweight per ton for 1970. However, the 1971 production of 345,000 ounces from Western Australia was 5,000 ounces less than in 1970. Australia's exports of refined gold were down sharply from the 1970 level of about 473,400 ounces to 76,600 ounces in 1971.

The Gold Mining Industry Assistance Act was extended by the Commonwealth Government for an additional 2 years from June 30, 1971, but amendments to increase the gold subsidy were rejected. The Western Australia Chamber of Mines contended that with an additional subsidy of between $2.4 million and $3.5 million, the industry could survive until mid-1973. The industry proposed that a maximum subsidy should be set at $12 per ounce until June 1973. It was predicted that, unless the gold subsidy was increased, there would be no gold miners left by 1973, the nickel work force would not have taken up all the slack, and there would also be fewer men engaged in exploration. WMC recently announced that two of its gold mines—Gold Mines of Kalgoorlie (Australia) Ltd. and Central Norseman (Gold Corp. N.L.)—will close unless the Commonwealth Government increases the gold subsidy. The principal gold producers and the quantities recovered during 1970 were as follows:

Company	Gold (troy ounces)
Central Norseman Gold Corp. N.L	52,585
Gold Mines of Kalgoorlie (Aust.) Ltd	137,605
Great Boulder Gold Mines Ltd	24,372
Hill 50 Gold Mine N.L	14,208
Lakeview and Star Ltd	104,380
North Kalgurli (1912) Ltd	48,067
Orlando Mines N.L	85,432

Iron and Steel.—The production of iron ore during 1971 increased 21 percent to 62.1 million tons compared with that of 1970, but the increase was smaller than in recent years. Small decreases occurred in steel and pig iron production. To a large extent this was due to strikes which resulted in a loss of production of some 86,000 tons of crude steel. Production of pig iron and steel decreased 0.3 and 1.3 percent, respectively. The demand for iron ore decreased in 1971, resulting from worldwide steel industry recession during 1971. This led to announcements of deferment of expansion programs by the Mount Newman Consortium and Hamersley Iron Pty. Ltd. The Mount Newman Consortium had planned to achieve a shipment capacity of 25 million tons per year by March 1972 and 30 million tons per year by September 1972 from its Western Australia Pilbara operation. Western Australia retained its role as Australia's leading iron ore State, accounting for nearly 82 percent of the total output in 1971. South Australia contributed 14 percent. Tasmania and the Northern Territory supplied the remaining 4 percent.

The principal producers and quantities of products shipped during the year were as follows:

Company	Iron ore (thousand metric tons)
Goldsworthy Mining Ltd., Western Australia (lump)	7,826
Hamersley Iron Pty. Ltd., Western Australia (lump, pellets)	19,354
Western Mining Corp. Ltd., (WMC), Western Australia (lump)	824
Broken Hill Pty. Co. Ltd., Western Australia (lump)	5,542
Broken Hill Pty. Co. Ltd., South Australia (lump, pellets)	8,445
Savage River Mines, Tasmania (pellets)	2,162
Frances Creek Iron Mining Corp. Ltd., Northern Territory (lump)	648
Mount Newman Iron Ore Co., Western Australia (lump)	13,872

The slower growth rate was attributed to an economic slowdown in Japan and other markets for Australia's iron ore exports and to the effects of U.S. dollar devaluation on export contracts written in United States currency. Approximately 80 percent of the iron ore and pellet production was exported, principally to Japan.

Mount Newman Iron Ore Co. produced 12.3 million metric tons from its Mount Whaleback mine in 1971 compared with 11.7 million tons in 1970. Mount Newman plans to raise its capacity in step with sales requirements to 36 million metric tons of ore annually by 1974. Currently, the Mount Newman Consortium holds contracts for future ore shipments totaling more than 234 million metric tons valued at over $2 billion. Mount Newman has agreed, however, to reduce its shipments to Japanese steel mills by 14 percent below basic requirements of its contracts during 1972. Development drilling at Mount Whaleback increased high-grade ore reserves to 660 million tons and indicated a potential reserve of more than 1 billion tons. Production began in 1969, and more than 35 million tons of iron ore have been shipped to steel mills in Japan, Europe, and Australia.

Hamersley Iron Pty. Ltd. production at its Mount Tom Price mine amounted to approximately 17.5 million tons in 1971, around 3 percent more than in 1970. Exports of ore and pellets to Japan increased from 13.1 million tons in 1970 to 14.5 million tons in 1971. Shipments to North America and Europe were nearly 3.0 million tons, a slight decline over those of 1970. Directors of Hamersley announced during the year that commercial production at Paraburdoo in Western Australia would be delayed and that its Mount Tom Price deposits were adequate to supply anticipated demand in 1972. A new discovery in Western Australia of 700 million tons of high-grade iron ore was made by a subsidiary of Hamersley. The deposit with an iron content around 62 percent increased Hamersley Mining Company's ore reserves of 1,000 million tons by 70 percent. Ore from this deposit cannot be used to fill existing contracts with Japanese mills because it contains slightly less iron than required. The Tom Price base grade ore for export to Japan is 64 percent iron. The company is investigating a scheme to upgrade material previously discarded because of low iron content. By using heavy media separation techniques, iron-rich overburden which is otherwise unsuitable for steelmaking would be treated. Hamersley currently stockpiles nearly 5 million tons of this material annually. It averages around 56 percent iron, compared with the export grade of some 62 percent iron. The separation plant would upgrade the ore to 64 percent iron suitable for blending with other Mount Tom Price ores. The plant would be based at Hamersley's port in Dampier.

Consolidated Gold Fields, in partnership with Cyprus Mines and Utah Development, has taken out options on the iron ore deposits of McCamey's Monster and Western Ridge in the Pilbara district of Western Australia. Reserves are estimated at 10 billion tons averaging 63 percent iron. A 2-year exploration and feasibility study is being conducted. In addition, the Mount Goldsworthy iron ore partners have announced the discovery of 250 million tons of high-grade iron ore south of Port Hedland in Western Australia.

Pig Iron and Steel.—The Broken Hill Pty. Co. Ltd. (BHP) and its wholly owned subsidiaries, Australia Iron and Steel Pty. Ltd. and Commonwealth Steel Co. Ltd., accounted for virtually all of Australia primary iron and steel. The consolidated annual report of BHP for periods ending May 31, 1971, summarized output of various products as follows:

Commodity	Quantity (thousand metric tons)	
	1970	1971
Pig iron	5,918	6,087
Steel ingots and billets	6,873	6,608
Blooms and slabs	5,883	5,668
Sheets, bars, billets, etc	2,875	2,706
Plate and strip	2,478	2,450
Merchant	1,595	1,637
Rod	533	482
Narrow cold-rolled strip	96	101
Tinplate	283	304

A strong domestic demand for steel was maintained during the year. However, production of raw steel fell from 6.8 million tons in 1970 to 6.7 million tons in 1971. Steel output was as follows: Newcastle, 2.1 million tons; Port Kembla, 3.5 million tons; and Whyalla 1.1 million tons.

BHP commenced operating the new No. 5 blast furnace during the year and will commission a new basic oxygen steelmaking shop early in 1972. This will increase raw steel production at Port Kembla to 5.4 million tons per annum. The company is also carrying out a feasibility study for a large new steel plant at Kwinana in Western Australia. The cost is estimated at $1.78 billion over a 10-year period and would produce about 10 million tons per year of semifinished steel, mainly for export.

The initial stage of what eventually will be a fully integrated steelmaking complex is well underway at Australia's Westernport Bay area in Victoria. Development of the site is a joint venture between the United Kingdom's Guest, Keen, and Nettlefolds (GKN) and the BHP of Australia. The facility is to be constructed in four stages: Cold strip complex; hot strip mill; iron and steelmaking operation with an annual capacity of 2 million tons; and expansion of the iron and steelmaking facilities to 4 million tons annually. John Lysaght Ltd. has an agreement with the Victorian Government to complete the first stage by 1973, the hot-strip facility by 1980, and an iron and steel works by 1985. The Government will provide the services required, such as water, roads, and rail and port facilities.

Lead and Zinc.—Production levels for lead and zinc in 1971 were substantially lower than the record levels established in 1970, but production of refined zinc was only slightly lower. Depressed prices and slackening demand for lead throughout the year forced the major domestic companies to reduce lead output, which also affected mine production of zinc. However, zinc mine production in the final quarter of 1971 was higher than in the corresponding period of 1970, resulting from increased capacity at the Rosebery mine in Tasmania. At Mount Isa, production of lead in concentrates was more than 20 percent less than in 1970, but production of zinc in concentrates fell by only 6 percent. Ore treated during the year decreased by more than 10 percent; lead grade of the ore was lower but zinc grade was higher. Broken Hill was affected by lower grade ore, as well as by a moderate decline in tonnage of ore treated by each producer. Overall production of lead at Broken Hill fell by about 6.5 percent while production of zinc was nearly 10 percent lower. The drop in zinc production was largely attributable to lower zinc ore grades at New Broken Hill Consolidated.

Lead production in all mine products was 402,687 tons in 1971 compared with 456,743 tons in 1970. Zinc production in all mine products was 450,297 tons compared with 487,207 tons in the previous year. Lead bullion produced at Mount Isa, Cockel Creek, and Port Pirie fell from 168,250 tons in 1970 to 157,850 tons in 1971. The nearly 15-percent decline in output at Mount Isa was partly offset by minor production of bullion at Port Pirie. A miners' strike at Broken Hill early in 1971 disrupted the normal supply of concentrates but the Port Pirie smelter continued to operate by treating concentrates from New Broken Hill Consolidated which are normally exported. The Broken Hill Associated Smelters Pty. Ltd. at Port Pirie, South Australia, produced 160,650 tons of refined lead, about 9 percent less than in 1970.

Contrary to the decline in mine production of lead and zinc, the output of refined zinc was only marginally lower. The Electrolytic Zinc Co. of Australasia Ltd. at Risdon, Tasmania, recovered 254,600 tons of zinc from concentrates produced at Broken Hill and the company's own Read-Rosebery mines. The principal mines and quantities recovered in concentrates and other mine products in recent years were as follows, in metric tons:

Mine	1968		1969		1970	
	Lead	Zinc	Lead	Zinc	Lead	Zinc
North Broken Hill Ltd	62,768	50,703	71,529	60,568	66,234	48,524
Broken Hill South Ltd	23,425	26,823	24,141	27,501	25,738	29,012
The Zinc Corp. Ltd	86,626	70,256	101,252	81,509	95,245	78,120
New Broken Hill Consolidated Ltd	76,369	127,754	84,671	170,403	81,742	148,374
Mount Isa Mines, Ltd	118,552	85,411	150,090	105,682	142,744	92,694
Electrolytic Zinc Co. of Australasia Ltd. (Read-Rosebery)	15,150	49,521	15,144	51,010	14,982	49,872

Output of refined zinc is expected to continue at a high level as elements of the Risdon expansion program come on-stream. The most recent additions to the Risdon refinery complex is the Jarosite plant which extracts zinc from zinc ferrite residue resulting from the normal treatment of zinc concentrates. The new plant will treat the 200 tons of new residue currently produced each day as well as about 150 tons of residue each day from a 1.4-million-ton stockpile. Recovery rate of zinc from concentrates at Risdon has been increased from about 87 percent to as high as 97 percent.

Manganese.—Production of metallurgical-grade manganese ore increased substantially during 1971 as BHP mines on Groote Eylandt, the principal producer, operated throughout the year. Of the 1,059,000-ton domestic production, BHP, in the Northern Territory, accounted for around 80 percent. Bell Brothers Pty. Ltd. mines and other producers in Western Australia supplied the remainder. After providing for the domestic requirement (200,000 tons in 1971), Australia exported a total of 588,000 tons of manganese ore. Japan received approximately three-fourths of the total exports in 1971 and most of the balance went to the United States and Europe.

The $27.4 million expansion program at Groote Eylandt Mining Co. Pty. Ltd. (subsidiary of BHP) in the Northern Territory is nearing completion. The annual production capacity for manganese ore is being expanded to 1.25 million tons per year in 1972. In addition, the expansion program included a new concentration plant, new ore stockpiling and handling facilities, power generating plant, and mobile equipment. Additional housing and township amenities, which will enable the population to reach about 600, are also nearing completion.

Agreement has been reached between Longreach Metals N.L. and Japanese trading houses Nissho-Iwai and Marubeni-Iida over the development of manganese deposits at Ripon Hills, Western Australia. Development of the deposits is expected to cost $30 million and production is planned to commence about 1974. According to Japanese sources, Japan intends to import 300,000 tons of ore in the first year of operation, building up to 1 million tons per year. Ore reserves at Ripon Hill were estimated at 60 million tons containing 22 percent manganese.

Nickel.—Domestic nickel output continued to expand but not as rapidly as in the preceding year. Production of nickel totaled 32,537 tons, an increase of 2,772 tons compared with 1970 production. WMC at Kambalda, Western Australia, treated 596,260 tons of nickel ore and produced 155,900 tons of concentrate containing 18,000 tons of nickel. The ore treated included 34,400 tons of purchased ore. Ore reserves, as of June 30, 1971, were estimated at 20.5 million tons, averaging 3.4

percent nickel. The program of broad-spaced grid drilling in the Kambalda area has resulted in the discovery of three additional ore bodies and other potential ore areas have been indicated.

Great Boulder Mines Ltd. and North Kalgoorlie Mines Ltd. treated 119,670 tons of nickel ore from their joint project at Scotia for the production of 18,914 tons of concentrate containing 2,000 tons of nickel. Problems associated with the early stage of operations at Scotia were overcome and deeper levels of the mine were developed. In view of these developments, company directors stated that annual production is expected to double. Diamond drilling at Great Boulder Mines' prospect at Ringlock, about 35 miles north of Kalgoorlie, has intersected narrow bands of massive sulfide. The drill holes extending along a strike length of 1,200 feet east intersected nickel sulfides at the base of the serpentine body in the area. The ore from Great Boulder Mines is expected to be processed at WMC's smelter when commissioned early in 1973.

The Government of Western Australia approved an agreement with Poseidon N.L. for the development of its nickel deposit at Mount Windarra, about 140 miles north of Kalgoorlie. Poseidon will spend around $60 million to bring the mine into production, which is scheduled for September 1972. Initial output rate will be 700,000 tons per year, with future expansion plans to a level of 1.2 million tons per year within 5 years. Poseidon ore is expected to be treated initially at the old Lake View and Star Ltd. plant near Kalgoorlie. The company expects to establish its own concentration plant at Mount Windarra as soon as feasible.

An announcement by Western Silcast Pty. Ltd., which is owned 20 percent by Silcast Exploration, reported the estimated 9 million tons of nickel ore (slightly more than 2 percent Ni) at the Agnew prospect in the Spargoville area was confirmed.

Agreement has been reached between the Queensland State Cabinet, Metals Exploration N.L., and Freeport Sulphur Co. to permit the partners to bring their Greenvale open pit lateritic nickel deposit into production by 1973. The mine is located near Ingham and will have a capacity of 2.7 million wet tons per year from ore reserves reported at 45 million, assaying 1.55 percent nickel. Feasibility studies were conducted by Metals Exploration Ltd., Freeport Australia, Inc., and Australian Consolidated Minerals N.L. on a possible large open pit nickel mine at Mt. Keith in Western Australia. Two hundred fifty million tons of 0.6 percent nickel have been proven so far.

Silver.—Reflecting the decreased mine production of lead, zinc, and other metals with which it is coproduced, Australia silver production declined 17 percent to 21.7 million ounces. However, production at Mount Isa Ltd. was nearly 20 percent above the 1970 level, making Queensland the leading silver-producing State. The increased production at Mount Isa was attributed to the expansion of the silver refinery which enabled six enlarged retort furnaces to be operated simultaneously, thereby increasing capacity from 10 to 12 million ounces per year. According to 1971 statistics, Queensland supplied 45 percent of the total Australian output of silver; New South Wales accounted for 43 percent; Tasmania contributed 9 percent; and three other States accounted for the remaining 3 percent of the national mine production of silver. Approximately 87 percent of the silver output was obtained from lead-silver bullion and concentrates. Zinc and copper concentrates provided 7 and 5 percent, respectively, and other mine products (including crude gold bullion) 1 percent of the total. Principal producers of silver during 1969 and 1970 were as follows:

Company	Quantity (thousand troy ounces)	
	1969	1970
North Broken Hill Ltd	4,063	2,334
Broken Hill South Ltd	1,631	1,269
Zinc Corp. Ltd	2,628	1,935
New Broken Hill Consolidated Ltd	1,910	1,276
Mount Isa Mines, Ltd	11,465	13,880
Electrolytic Zinc Co. of Australasia Ltd	1,662	906

Domestic refineries reported production of 8,453,000 ounces of silver in 1971, compared with 9,422,000 ounces the preceding year. In 1970 Broken Hill Associated Smelters Pty. Ltd. at Port Pirie recovered 7.1 million ounces of silver from concentrates generated by Broken Hill mines. Electrolytic Refining and Smelting Co. of Australia Pty. Ltd. at Port Kembla recovered 1.2 million ounces from copper concentrates and slimes. The Royal Mint in Perth recovered about 170,000 ounces of refined silver from gold bullion produced by mines in Western Australia.

Exports of silver in lead bullion and concentrates, and all other products in 1970 were about 12.8 million ounces. Domestic sales of refined silver were about 3.2 million ounces.

Tin.—Domestic tin production continued to expand and preliminary statistics indicate that production of tin in concentrates in 1971 exceeded 9,484 long tons, the highest level of output recorded since 1907. Increased production in 1971 resulted from a sharp lift in output from hard-rock operations in northwest Tasmania and central New South Wales. By the end of 1971 output of tin-in-concentrates from the three principal hard-rock deposits, Renison, Mount Cleveland, and Ardlethan was running at an annual rate of about 6,298 long tons. The Moolyella mine, about 10 miles northeast of Marble Bar, is the principal tin field in the northwest division of Western Australia and second only to Greenbushes among the States tin-producing centers. Cleveland Tin, N.L., one of the two major lode tin mining companies in Australia, has announced an expansion scheme designed to raise its normal annual production of tin concentrates from 15,747 long tons to 2,116 long tons. Additionally, Cleveland is to design and erect a commercial-scale pilot plant for tin flotation, designed to recover fine tin from that portion of the material now rejected as tailings from gravity concentration.

Principal producers of tin concentrate and quantities of contained tin produced in 1969 and 1970 were as follows:

Company	Quantity (long tons)	
	1969	1970
Aberfoyle Tin Co. N.L	402	433
Ardlethan Tin N.L	805	1,022
Cleveland Tin N.L	1,510	1,580
Cooglegong Tin Pty. Ltd	66	72
Gibsonvale Alluvials N.L	360	212
Greenbushes Tin N.L	248	240
J. A. Johnston & Sons Pty. Ltd	61	76
Pilbara Tin Pty. Ltd	160	226
Ravenshoe Tin Dredging Ltd	404	438
Renison Ltd	2,641	4,723
Storeys Creek Tin Mining Co. N.L	38	104
Tableland Tin Dredging N.L	271	387
Tullabong Tin Ltd	103	222

It is believed that Australia may become as large in tin production as Malaysia because of the vast potential of deposits in the Pilbara region of Western Australia. Reserves of tin-bearing gravel at Pilbara show 250 million cubic yards averaging possibly more than 1 pound of tin per cubic yard with some pockets of gravel containing as much as 80 pounds of tin per yard.

In contrast to improved production of lode tin, output from alluvial deposits continued to decrease. Resumption of full-scale dredging operations at Mount Garnet increased output from the Greenbushes area, Western Australia, and development of promising alluvial deposits in northern New South Wales could reverse this trend in 1972. Also, Central Deborah Gold Mining Co., N.L., reported its alluvial tin mining operation at Bald Knob Via Glen Innes, New South Wales, went into production. Sales of 73 percent tin-in-concentrates to Associated Tin Metals Pty., Ltd., were begun in mid-1971.

Domestic consumption of primary refined tin in 1971 totaled 37,498 long tons, slightly higher than in 1970. Of this total, about one-half was used in the production of tinplate, one-third for solders, and the remainder for tinning, bearing, and type metals, bronze and brass production, and miscellaneous uses. Exports of tin in that year totaled 1,072 long tons of refined and 34,447 long tons of tin-in-concentrates. Most of the exported tin-in-concentrates went to the Netherlands.

Titanium Concentrates.—Following a period of continued expansion in the 1960's, growth in the domestic mineral sands industry began leveling off in 1971. Production of rutile and ilmenite concentrates was marginally less than in 1970; however, zircon production established a record of about 400,000 tons.

Domestic output of ilmenite concentrates in 1971 decreased to about 8 percent to 814,842 tons. Ilmenite use is confined primarily to the manufacture of titanium dioxide pigments and the slow world economy has been reflected in lower pigment sales and decreased demand for ilmenite. Early in the year, Norseman Titanium N.L. and Mid-East Minerals N.L. announced plans to start production of ilmenite sand in the Busselton area of Western Australia in the first half of 1972. Two wet concentrators were to be established, one at Capel and the other at Wonnerup.

Norseman also announced the start of construction of a dry separation plant about 3 miles north of Capel. Production of ilmenite at the rate of 125,000 tons per year was planned by early 1972. At yearend, in view of the developing surplus of ilmenite concentrates and the consequent downward pressure on prices, Norseman and Mid-East announced that they had indefinitely postponed their plans to mine at Capel and Busselton.

In Western Australia a new beach sand containing rutile, zircon and ilmenite was discovered around Eneabba, 160 to 170 miles north of Perth. The Western Australia area is a major source of ilmenite but rutile has been rare. The original discovery was made by Western Titanium a major ilmenite producer. Local farmers immediately staked claims for offering to interested mining companies. Allied Minerals, which held options to buy 22 claims at Eneabba, entered a joint venture with A. V. Jennings Industries (Australia) Ltd. Jennings will hold the controlling 55-percent interest, and Allied Minerals the remainder. Construction work was scheduled to begin in June 1972 with the first cargo of export rutile to leave through the port of Geraldton in mid-1973. Reserves were placed at more than 14 million tons of heavy minerals (about 9 percent of the beach sands), containing an average of 8 percent rutile; 37 percent ilmenite; 32 percent zircon; 20 percent altered ilmenite; 1 percent monazite; and 2 percent other minerals. The initial production target is for some 50,000 tons of rutile per year. Dry mining will be initiated using bucket-wheel excavators to remove mineral sands at a rate of 4.5 million tons per year, and this will be increased later to between 9 million and 12 million tons per year.

Planet Metals, Ltd., announced encouraging results in its search for rutile off the coast of New South Wales. Based on the drilling of more than 1,000 holes, some extending 40 feet below the sea floor in waters up to 120 feet in depth, Planet announced reserves of over 375 million tons of sands, bearing 0.20 to 0.22 percent rutile and a further 500 million tons of indicated reserves. The company is considering dredging from a barge with a throughput of 10,000 tons of sand per hour. Dry separation of the heavy mineral concentrate would be onshore in the usual manner.

Domestic consumption of titanium concentrates in 1970 amounted to about 2,800 tons of rutile, mainly for manufacture of arc-welding rods, and 81,000 tons of ilmenite, most of which was used in domestic pigment producers.

Zircon concentrates consumption in 1970 has been estimated, on the basis of domestic sales, at about 4,800 to 5,600 tons per year. The major portion of these concentrates was used by foundries and manufacturers of ceramic products.

NONMETALS

Phosphate Rock.—Although Australia's phosphate rock requirements are supplied almost entirely by imports, new deposits in Queensland promise to make Australia self-sufficient in phosphate production. In 1971 domestic production of 15,000 tons was confined to South Australia. Imports of phosphate rock were 1,143,000 tons.

Broken Hill South Ltd. will start production on new deposits of rock phosphate in Queensland. After waiting for more favorable market conditions and after spending about $15.5 million on feasibility studies, the company plans to start production in the late 1970's. A new deep water port will be built on the Gulf of Carpentaria and a slurry pipeline will be constructed over the 200 miles between the mine and the coast.

A number of outcrops of phosphate have been discovered in recent years in the Georgina and Daly Basins that stretch over 110,000 square miles of Northwestern Queensland and the Northern Territory. The main discoveries made by Broken Hill South are the Dutchess Lady Annie and Lady Jane deposits. Combined reserves of these deposits are assessed at 2 billion tons of 17 percent phosphorus pentoxide (P_2O_5).

Salt.—During 1971 the Australian salt industry produced over 3 million tons. Although complete statistical data on domestic production are not available, the output is apparent in officially reported exports of about 2.5 million tons in the 1970–71 fiscal year compared with the 762,000-ton output in the 1969–70 fiscal year.

Western Australia replaced South Australia as the leading salt-producing State and accounted for about two-thirds of the domestic output in 1971. Five new fields in

Western Australia, each with an annual production capacity of at least 500,000 tons, were in operation or in the planning stage. The largest of these fields were those worked by Dampier Salt Ltd., Shark Bay Gypsum Pty. Ltd., and Leslie Salt Company in which output approached new capacity level. Smaller quantities were obtained by Exmouth Salt Pty. Ltd., Lefroy Salt Pty. Ltd., and Taxada Mines Pty. Ltd. The new fields are almost entirely export-oriented and have concentrated on supplying the developing Japanese market. Some markets, however, have been found in New Zealand and other nearby areas. All new fields will be readily expansible, as demand dictates.

The principal producer in South Australia was Imperial Chemical Industries of Australia and New Zealand Ltd. (I.C.I.A.N.Z.). This company, which operates a solar salt field at Dry Creek near Adelaide, produced around 400,000 tons. Much of the output from this field is used to supply the company's soda ash, caustic soda, and chlorine plant located nearby at Osborne. At Whyalla, S.A., BHP reported production of 63,000 tons, and Central Queensland Salt Industries Ltd., located near Port Alma, Queensland, produced 61,420 tons. Most of the domestic requirements for industrial chemicals, table salt, and food processing were met by production from Queensland, Victoria, and South Australia. Apparent consumption of salt was 900,000 tons in 1969 and 1.2 million tons in 1970.

Sulfur.—Imports of elemental sulfur principally from Canada, the United States, and Poland declined for the third consecutive year. Imports were 264,300 tons, which represented a 7.5-percent decrease compared with those of 1970. For the first time since 1955 no imports were recorded from Mexico. No domestic deposits of elemental sulfur have been reported; small quantities of sulfur, however, were obtained from pyrite, metallic sulfide ores, and from three oil companies. Practically all imported sulfur and virtually all of the sulfur recovered from domestic pyrite and sulfide ores was used in manufacturing sulfuric acid. Reflecting declining requirements by manufacturers of superphosphate fertilizers, production of sulfuric acid in 1971 was about 4 percent below the 1970 level. During 1970, approximately 70 percent of the acid was made from imported elemental sulfur, 8 percent from pyrites, and 21 percent from zinc and lead concentrates.

Companies producing pyrites in 1970 for use in the manufacture of sulfuric acid were Mount Lyell, Tasmania (byproduct of base metal operations); Nairne Pyrites (pyrites mining); Gold Mines of Kalgoorlie, Western Australia (byproduct of gold mining); and Electrolytic Zinc Industries Ltd.

A large quantity of sulfur contained in base metal concentrates, particularly zinc concentrates, is exported from Australia. In 1970 the sulfur content of zinc concentrates exported was 187,000 tons, of which about 127,000 tons was recoverable. Domestic consumption of sulfuric acid in 1970 totaled 1,655,000 tons, of which 72 percent went to manufacture superphosphate fertilizers, 4 percent to ammonium sulfate, 21 percent to various other chemicals, and 3 percent to metallurgical uses.

MINERAL FUELS

Black Coal.—Despite the adverse affects of industrial disputes, domestic output of black coal during 1971 continued to establish new national records. Production increased for the 8th year in succession, but for the first time for several years the rise was relatively small. Annual production was 49.0 metric tons, of which 36.6 tons was from underground mines and 12.4 tons was from opencut mines. Production in New South Wales was 36 million tons, representing an increase of nearly 2 percent over that of 1970. Queensland production was 10.5 million tons, about 4 percent more than in 1970. The two States supplied 95 percent of the total black coal production in 1971. Mines in South Australia, Western Australia, Tasmania, and Victoria produced a total of 3 million tons, virtually all of which was consumed locally. Approximately 90 percent of the coal mined underground in Australia was mined in New South Wales. There were 88 active mines in New South Wales as of December 30, 1971, with a total employment of 18,454. The drop in output per man-shift during the past year of 7.8 percent to an average for all mines of 10.07 tons was caused by the reduction in workweek to 35 hours. Losses arising from industrial disputes accounted for 4.2 percent of possible production.

Table 5.—Production of black coal

(Thousand metric tons)

State	1968	1969	1970
Queensland	6,657	8,635	9,964
New South Wales	[r] 30,834	[r] 33,973	35,433
Victoria	27	--	--
Tasmania	92	[r] 117	112
South Australia	[r] 2,111	[r] 2,245	1,827
Western Australia	[r] 1,104	[r] 1,107	1,198
Total	[r] 40,825	[r] 46,077	48,534

[r] Revised.

Black coal reserves are estimated at 23.9 billion long tons, consisting of approximately 11.4 billion tons in Queensland; 11.8 billion tons in New South Wales; and the remaining 0.7 billion tons in Victoria, Tasmania, Southern Australia, and Western Australia. Of these reserves, it is estimated that 15 billion tons is of coking-coal quality. The Joint Coal Board reported output in leading producing States as shown in table 5.

Domestic consumption of black coal in recent years was distributed as follows:

Industry	Quantity (thousand metric tons)		
	1968	1969	1970
Iron and steel	7,612	7,782	7,886
Electricity	12,095	12,578	13,225
Railways	430	370	385
Town gas	925	702	686
Cement	864	899	912
Metallurgical coke	486	493	512
Other (including bunkers)	2,299	2,469	2,730
Total	24,711	25,298	26,336

Exports to Japan fell from 10.7 million tons in 1970 to 9.0 million tons in 1971. But exports to other destinations increased from 1.3 million tons to 2.7 million tons. The European continent took 990,000 tons, an increase of 49,000 tons. The new development was the export of 1.2 million tons to the United Kingdom.

Costain Mining, U.K., announced plans to extract 50 million tons of coal from an opencast site at Ravensworth in New South Wales. The site will be excavated in a series of cuts 90 to 100 feet wide which will be progressively backfilled. The coal will be transported in 110-ton dump trucks. Up to 5 million tons per year of coal will be sent to the new 2,000-megawatt Leddell power station over a 14-year period. Two Bucyrus-Erie 1370-W walking draglines fitted with 65-cubic-yard buckets are to be used in the removal of 250 million cubic yards of overburden on the 3,000-acre site. The dragline can shift 50,000 tons of overburden in an 8-hour shift.

BHP has developed the Leichhudt Colliery at Blackwater, Queensland, into a fully integrated operation producing 800,000 tons of coking coal annually. The Blackwater coal is being blended with coal from the Newcastle area of New South Wales for use at the Whyalla steelworks. Production is planned to reach capacity by early 1974.

In other developments Utah Development Co. reportedly reached agreement with Marcona Carriers Ltd. concerning the transport from Hay Point, Old of 900,000 tons of coking coal over 29 months starting February 1972. A contract covering the shipment to Antwerp and Hamburg of 750,000 tons of coal over 33 months starting April 1972 was also signed.

Brown Coal.—All of Australian output of brown coal, amounting to about 23.4 million tons annually since 1966, is produced in Southern Victoria. The State Electricity Commission (SEC) produced about 98 percent of the total output from opencut mines near Morwell and Tallourn in the Lathobe Valley. Several relatively small mines operated by private companies produced the remainder. During the fiscal year ending June 30, 1970, the Morwell and Tallourn North opencuts produced 23 million tons of brown coal. Two bucket-wheel excavations having productive capacities of 1,600 tons and 2,400 tons of brown coal per hour, respectively, began operation at Morwell. One excavation was used to excavate coal and the other to remove overburden.

Since brown coal cannot be economically transported or safely stockpiled, virtually the entire mine production was consumed locally. The consumption pattern in the past fiscal year showed approximately 75 percent required to generate electric power; 20 percent to manufacture of briquets (part of which was used in power generation); and about 5 percent to use as factory fuel.

Manufacture of brown coal briquets by the Tallourn and Morwell briquet works in 1971 totaled 1,599,000 tons (1,426,000 tons in 1970).

Petroleum and Natural Gas.—Production of crude oil reached an estimated 113 million barrels in 1971 (about 412,000 barrels per day), 72 percent more than in 1970. Production accelerated in the latter part of 1971 when the large Kingfish field in Bass Strait came fully onstream.

Production from Kingfish A platform began in April and from Kingfish B in November 1971. Thereafter, output from the Bass Strait fields reached 300,000 barrels per day. The Halibut field contributes about 100,000 barrels per day, having been cut back from a peak of more than 200,000 barrels per day attained while pipelines from the Kingfish platforms were being completed.

Other producers were Western Australian Petroleum's Barrow Island field which supplied 45,300 barrels per day in 1971, and the declining Queensland fields, Moonie and Alton, where production has dropped to less than 3,000 barrels per day. The latter fields are expected to reach the end of their economic life in 1976.

Commercial production of natural gas is now established in four regions—Bass Strait, Victoria; the Cooper Basin, South Australia; the Roma district, Queensland; and the Dongara, Western Australia.

National reserves of crude oil at yearend 1971 were estimated at 1,850 million barrels, compared with 1,793 million barrels for 1970. National gas reserves stood at 13,800 billion cubic feet on December 31, 1971.

Expenditures on petroleum exploration, development, and production in 1970, the most recent year in which complete data are available, totaled $152 million. Private enterprise contributed $136.5 million and Commonwealth and State Governments $11.2 million. Victoria offshore exploratory, development, and other activities received $52.8 million of the private-enterprise contribution.

Consumption of petroleum products in 1971 was 192 million barrels up 25 percent from that of 1970. Motor gasoline totaled 65 million barrels, followed by fuel oils (including bunkers) 56 million barrels, diesel distillate 22.5 million barrels, aviation 8 million barrels, and heating oil (a white domestic fuel) 3.5 million barrels.

Refineries exported 9.8 million barrels of products in 1971, a 17-percent increase compared with 1970 exports. Shipments of petroleum products from Esso-BHP's Westernport plant to Japan totaled a further 4 million barrels. Refinery exports—principally fuel oil, middle distillates, gasoline and lubricants—continue to find their main markets in Malaysia, Singapore, New Zealand, and the Pacific Islands. Current expansion plans include a 46,000-barrel-per-day crude distillation unit and a 14,000-barrel-per-day Rheniformer at Kurnell by Australian Oil Refining (Caltex) for completion in 1973; uprating of primary processing capacity at BHP's Kwinana refinery to 108,000 barrels per day for completion this year; and installation of a 20,000 barrel-per-day catalytic reformer at Shell's Clyde refinery for completion in 1973.

The Mineral Industry of Austria

By Grace N. Broderick [1]

During 1971 Austria produced a variety of mineral commodities including aluminum, coal, copper, lead and zinc, iron and steel, cement, graphite, kaolin, magnesite, salt, crude oil and natural gas. Except for magnesite and graphite, production was not significant by world standards and imports of raw minerals and fuels were essential to sustain the industrial economy.

The Austrian economy in 1971 continued its unprecedented boom. Although the growth rate declined from 7.1 percent in 1970 to about 6 percent in 1971, domestic consumer buying, the construction industry, and tourism kept the economy moving at a high level. Only a small part of the gross national product (GNP) was contributed by the mineral industry.

In 1971 Austria's state-owned Österreichisch-Alpine Montangesellschaft A. G. (ÖAMG), of Vienna, and a number of private firms formed a new mining and exploration company, Austromineral Österreichische Gesellschaft für Lagerstattenschliessung, Bergbau und Mineralwirtschaft G.m.b.H. KG; participation in this new company has since been acquired by the nationalized Vereinigte Österreichische Eisen und Stahlwerke A.G. (VÖEST), of Linz. The company was formed to ensure that the country's raw material needs are met on a systematic basis, and the company is to provide a wide range of services. It will undertake prospecting work, both in Austria and overseas, and will participate in exploiting promising deposits.

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[1] Physical scientist, Division of Ferrous Metals.

Table 1.—Austria: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971 [p]
METALS			
Aluminum:			
Alumina (abrasive-grade), gross weight	27,268	27,537	27,226
Metal:			
Primary	89,680	90,004	90,698
Secondary	34,719	32,202	59,353
Antimony:			
Mine output, metal content	623	610	467
Antimony sulfide	707	749	NA
Cadmium metal	25	22	25
Copper:			
Mine output, metal content of ore	2,349	2,262	2,649
Metal, refined, including secondary	19,325	22,504	21,295
Germanium, metal content of concentrates kilograms	7,000	6,800	[e] 7,200
Iron and steel:			
Iron ore and concentrate, gross weight thousand tons	3,982	3,997	4,171
Pig iron do	2,816	2,964	2,849
Ferroalloys (electric furnace) do	6	6	4
Crude steel do	3,926	4,079	3,960
Semimanufactures do	2,916	3,025	2,965
Lead:			
Mine output, metal content of ore	6,807	6,003	7,715
Metal:			
Primary	7,480	8,743	9,314
Secondary	7,244	6,858	5,881
Manganese, Mn content of domestic iron ore	77,834	81,074	83,415
Silver metal, including secondary troy ounces	118,315	175,864	225,055
Tungsten, metal content of:			
Crude ore	160	125	68
Concentrate	136	85	46

See footnotes at end of table.

Table 1.—Austria: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971 p
METALS—Continued			
Zinc:			
Mine output, metal content of ore	14,234	15,707	21,073
Metal, refined	15,532	16,018	15,969
NONMETALS			
Barite	708	315	789
Cement hydraulic thousand tons	4,558	4,806	5,491
Clays:			
Illite	234,525	263,058	NA
Kaolin:			
Crude	348,072	339,844	302,334
Marketable	97,510	98,332	e 88,000
Other	79,705	74,888	NA
Diatomite	1,765	3,772	3,084
Feldspar	1,806	1,206	2,656
Graphite, crude	25,825	27,733	21,392
Gypsum and anhydrite, crude thousand tons	676	628	594
Lime do	731	741	672
Magnesite:			
Crude do	1,608	1,609	1,556
Sintered or dead burned do	526	546	508
Caustic calcined do	183	180	191
Pigments, mineral (iron mica)	8,363	7,734	NA
Pumice (trass)	18,519	19,866	32,237
Salt:			
Rock	926	940	1,036
In brine:			
Evaporated thousand tons	225	265	252
Other do	193	225	e 220
Total do	418	490	e 472
Sand and gravel:			
Industrial sand do	241	217	NA
Other sand and gravel do	4,293	4,367	NA
Stone: [1]			
Dimension stone do	118	84	NA
Quartz and quartzite do	124	86	98
Other quarry stone and broken stone do	1,037	2,061	NA
Sulfur:			
Byproduct, recovered, elemental do	3	e 3	e 3
Content of gypsum and anhydrite used for sulfur raw materials do	56	44	e 44
Other, including recoverable content of nonferrous sulfide ores and of spent oxide do	10	10	e 10
Total do	69	57	e 57
Talc and soapstone	94,138	100,159	91,621
MINERAL FUELS AND RELATED MATERIALS			
Coal, brown coal and lignite thousand tons	3,841	3,670	3,770
Coke:			
Gashouse do	85	--	--
Metallurgical do	1,730	1,768	1,638
Gas:			
Manufactured, all types [2] million cubic feet	72,713	--	--
Natural:			
Gross do	52,379	67,007	66,790
Marketed do	50,331	66,992	64,293
Petroleum:			
Oil shale	510	520	490
Crude oil thousand 42-gallon barrels	19,236	19,515	17,546
Refinery products:			
Gasoline, aviation, and motor do	7,851	8,487	11,697
Jet fuel do	728	646	800
Kerosine do	26	194	
Distillate fuel oil do	8,174	11,437	12,534
Residual fuel oil do	16,168	17,316	22,768
Lubricants do	1,884	2,128	1,935
Liquefied petroleum gas do	1,109	1,227	1,026
Bitumen do	1,545	1,619	1,674
Other do	834	1,819	2,490
Refinery fuel and losses do	567	638	654
Total do	38,886	45,511	55,578

e Estimate. p Preliminary. NA Not available.

[1] Excluding stone used by the cement and iron and steel industries.

[2] Includes blast furnace and coke oven gas. Manufactured gas is reported in source as gas having a calorific value of 4,200 calories per cubic meter. (One cubic meter equals 35.3145 cubic feet.)

Table 2.—Austria: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum:			
Oxide and hydroxide (includes manufactured corundum)	23,105	21,961	Poland 6,827; West Germany 4,890; United Kingdom 1,987.
Metal, including alloys:			
Scrap	8,238	7,154	Italy 3,749; West Germany 2,543.
Unwrought	27,132	18,843	West Germany 14,487; Turkey 1,835.
Semimanufactures	39,849	33,405	United Kingdom 3,567; Italy 3,293; Yugoslavia 2,832; Portugal 2,542.
Antimony ore and concentrate	196	140	West Germany 61; Belgium-Luxembourg 59.
Cadmium metal, including alloys, all forms kilograms	300	200	NA.
Chromium:			
Chromite	708	94	Yugoslavia 81.
Oxide kilograms	2,100	800	NA.
Columbium and tantalum:			
Tantalum metal, including alloys, all forms do	6,800	6,100	United Kingdom 2,900; West Germany 2,000.
Copper:			
Ore and concentrate	--	1,977	All to East Germany.
Copper sulfate	691	1,080	Italy 930; Poland 150.
Metal, including alloys, all forms:			
Scrap	497	1,074	West Germany 966; Italy 65.
Unwrought	[r] 5,739	6,525	West Germany 5,202; Switzerland 1,039.
Semimanufactures	10,223	11,148	Sweden 2,849; Switzerland 2,337; Bulgaria 1,614.
Gold metal, unworked or partly worked troy ounces	19,162	17,876	West Germany 7,555; Italy 7,266; Yugoslavia 900.
Iron and steel:			
Ore and concentrate, except roasted pyrite	4,312	641	Belgium-Luxembourg 600.
Metal:			
Scrap	5,041	6,309	West Germany 2,802; Switzerland 1,903; Italy 1,309.
Pig iron, ferroalloys, and similar materials thousand tons	40	31	Italy 25.
Steel:			
Primary forms do	[r] 417	371	West Germany 354; United Kingdom 8.
Semimanufactures:			
Bars, rods, angles, shapes, and sections do	221	226	Switzerland 42; West Germany 40; Italy 34.
Universals, plates and sheets do	613	508	West Germany 175; U.S.S.R. 98; United Kingdom 34.
Hoop and strip do	77	81	Switzerland 35; West Germany 11; Italy 7.
Rails and accessories do	63	40	Switzerland 18; Romania 8; Canada 4.
Wire do	64	58	Switzerland 17; Hungary 8; West Germany 6.
Tubes, pipes and fittings do	[r] 78	85	Sweden 17; United Kingdom 16; Switzerland 15.
Castings and forgings, rough do	4	7	Switzerland 3; West Germany 1.
Lead:			
Oxide	1,165	1,427	Czechoslovakia 1,208.
Metal, including alloys, all forms	2,464	2,435	Italy 1,509; West Germany 576; Yugoslavia 297.
Magnesium metal, including alloys, all forms	2,079	2,879	West Germany 2,185; Italy 667.
Manganese oxide	351	361	Brazil 308; Denmark 50.
Mercury 76-pound flasks	322	273	West Germany 133; Switzerland 32.
Molybdenum metal, including alloys, all forms	436	491	West Germany 257; United Kingdom 99.
Nickel metal, including alloys, all forms	321	487	Yugoslavia 194; West Germany 180.
Platinum-group metals, and silver metal, including alloys, all forms:			
Platinum group troy ounces	9,163	16,365	West Germany 11,928; Romania 3,826.
Silver:			
Bullion thousand troy ounces	495	161	All to West Germany.
Other (powder) do	23	51	Do.
Semimanufactures do	235	296	Yugoslavia 273; Romania 16.

See footnotes at end of table.

Table 2.—Austria: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS—Continued			
Tin:			
Oxide long tons	21	69	Bulgaria 27; Czechoslovakia 20; Poland 15.
Metal, including alloys, all forms do	16	77	Yugoslavia 62; Switzerland 7.
Titanium oxide	19	(1)	NA.
Tungsten:			
Ore and concentrate	239	172	All to West Germany.
Metal, including alloys, all forms	93	93	West Germany 42; Italy 10; Japan 7.
Zinc:			
Ore and concentrate	715	1,196	All to Italy.
Oxide	27	76	Ireland 55; Hungary 20.
Metal, including alloys, all forms	2,298	1,035	Italy 330; West Germany 326; Yugoslavia 276.
Other:			
Ore and concentrate	98	81	All to West Germany.
Ash and residue containing nonferrous metals	19,276	23,577	Italy 13,692; West Germany 6,018; Yugoslavia 2,741.
Waste and sweepings of precious metals kilograms	22,049	25,826	West Germany 25,313; France 429.
Oxides, hydroxides and peroxides of metals n.e.s	53	74	Czechoslovakia 63; West Germany 10.
Base metals, including alloys, all forms, n.e.s	55	52	West Germany 28; United Kingdom 13.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum and other natural abrasives	6	8	NA.
Dust and powder of precious and semiprecious stones (including diamond) kilograms	41	480	NA.
Grinding and polishing wheels and stones	7,749	8,887	West Germany 1,078; Yugoslavia 1,042; Poland 1,036; Italy 1,032.
Asbestos	35	29	NA.
Barite and witherite	70	--	
Cement	38,844	247,831	Yugoslavia 198,576; West Germany 47,296.
Chalk	3,183	3,708	Hungary 1,256; Italy 1,040; West Germany 893.
Clays and products (including all refractory brick):			
Crude:			
Kaolin (china)	29,071	25,211	Italy 16,074; Switzerland 5,565; Poland 2,253.
Other	1,439	576	Italy 226; United Kingdom 80; Argentina 51.
Products:			
Refractory (including nonclay bricks)	r 231,857	284,265	West Germany 60,357; France 56,670; Sweden 29,914.
Nonrefractory	r 299	22,659	Yugoslavia 21,567.
Cryolite and chiolite, natural	9	21	All to Mexico.
Diamond, industrial thousand carats	--	50	Yugoslavia 5.
Diatomite and other infusorial earths	107	53	Yugoslavia 31.
Feldspar	415	712	Greece 352; Lebanon 175.
Fluorspar	--	41	Israel 40.
Graphite, natural	24,454	25,820	Italy 10,672; Poland 6,477; West Germany 5,454.
Gypsum and plasters	116,470	142,903	West Germany 117,434; Switzerland 25,463.
Lime	4,311	18,341	Hungary 9,133; West Germany 3,705; Yugoslavia 3,689.
Magnesite	239,129	213,448	West Germany 124,474; France 18,762; Hungary 15,871.
Mica, all forms	27	28	Hungary 9; Romania 6; Yugoslavia 6.
Pigments, mineral, including processed iron oxides	5,766	5,220	United Kingdom 1,479; West Germany 1,398; France 429.
Precious and semiprecious stones including diamond:			
Natural kilograms	194	1,260	West Germany 391; United States 89; Sweden 26.
Manufactured do	615	736	Yugoslavia 119; United States 88; Sweden 76.
Pyrite	2,288	--	
Salt	15	10	NA.

See footnotes at end of table.

Table 2.—Austria: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
NONMETALS—Continued			
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous, including marble and limestone	80,744	102,424	West Germany 76,708; Switzerland 25,235.
Slate	3	12	NA.
Other	57,232	68,235	West Germany 48,096; Yugoslavia 19,491.
Worked:			
Paving and flagstone	19,884	18,005	Switzerland 10,782; West Germany 7,203.
Slate	33	32	NA.
Other	1,306	4,066	West Germany 3,041; Switzerland 616; United States 273.
Dolomite	16,738	11,076	United Kingdom 4,813; West Germany 2,770; Czechoslovakia 186.
Gravel and crushed rock	447,043	445,770	Switzerland 214,870; West Germany 202,241.
Limestone	20	1,811	All to West Germany.
Quartz and quartzite	151	189	Czechoslovakia 140; Italy 39.
Sand, excluding metal bearing	52,966	63,270	West Germany 40,047; Switzerland 16,940; Italy 4,994.
Sulfuric acid and oleum	158	501	Hungary 499.
Talc, steatite, soapstone and pyrophyllite	79,723	83,929	West Germany 37,640; Italy 11,346; Poland 6,558.
Other nonmetals, n.e.s.:			
Crude	2,974	4,529	West Germany 3,992; Czechoslovakia 162; Yugoslavia 150.
Slag, dross and similar waste, not metal bearing	118,085	26,824	West Germany 25,613.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	109	9	NA.
Carbon black and gas carbon	4	4	NA.
Anthracite and bituminous coal and briquets	24	12	NA.
Lignite and lignite briquets	7,492	7,803	All to West Germany.
Coke and semicoke	142,453	5,757	Romania 3,480; Yugoslavia 2,203.
Hydrogen, helium and rare gases thousand cubic feet	1,970	12,154	West Germany 11,814.
Peat, including peat briquets and litter	20	25	NA.
Petroleum refinery products:			
Gasoline, aviation and motor thousand 42-gallon barrels	26	1	Mainly to West Germany.
Kerosine and jet fuel do	106	18	All to Poland.
Distillate fuel oil do	2	2	Switzerland 1; West Germany 1.
Residual fuel oil do	(1)	(1)	NA.
Lubricants do	[r] 931	904	Poland 482; Czechoslovakia 279.
Other do	53	50	Yugoslavia 18; Poland 13; Switzerland 7.
Total do	[r] 1,118	975	
Mineral tar and other coal-, petroleum-, or gas-derived chemicals	4,830	8,370	West Germany 6,506; Yugoslavia 800.

[r] Revised. NA Not available.

(1) Less than ½ unit.

Table 3.—Austria: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum:			
Bauxite	26,060	29,565	NA.
Oxide and hydroxide	200,278	198,959	NA.
Metal, including alloys:			
Unwrought including scrap	11,468	16,484	Poland 2,767; Hungary 2,612; East Germany 2,326; Czechoslovakia 1,895.
Semimanufactures	9,341	11,443	West Germany 5,853; Switzerland 3,130.
Antimony:			
Ore and concentrate	--	28	All from Thailand.
Metal, including alloys, all forms	89	45	Yugoslavia 10; Netherlands 8; United Kingdom 6.
Arsenic trioxide, pentoxide, and acids	66	68	France 50; West Germany 18.
Cadmium metal, including alloys, all forms	11	15	West Germany 13.
Chromium:			
Chromite	85,175	81,793	Republic of South Africa 35,288; Turkey 19,633; Cyprus 13,803.
Oxide and hydroxide	294	259	West Germany 169; Hungary 24.
Cobalt oxide and hydroxide kilograms	1,200	1,900	Belgium-Luxembourg 1,000; West Germany 800.
Columbium and tantalum:			
Tantalum metal, including alloys, all forms do	7,700	16,200	West Germany 9,400; United States 6,800.
Copper:			
Copper sulfate	78	111	Switzerland 102.
Metal, including alloys:			
Scrap	9,238	13,544	West Germany 7,766; United States 1,990; Switzerland 1,765.
Unwrought	27,031	33,041	West Germany 17,605; Zambia 7,274; Republic of South Africa 2,812.
Semimanufactures	5,481	5,716	West Germany 2,366; United Kingdom 1,040; Sweden 1,001.
Gold metal, unworked and partly worked thousand troy ounces	787	1,102	Switzerland 776; West Germany 197; Republic of South Africa 117.
Iron and steel:			
Ore and concentrate, except roasted, pyrite thousand tons	1,605	2,112	Brazil 1,595; U.S.S.R. 353; Sweden 73.
Roasted pyrite do	223	238	Italy 226; Czechoslovakia 6.
Metal:			
Scrap do	96	79	West Germany 22; Poland 20; East Germany 14.
Pig iron, including cast iron[1] do	105	87	U.S.S.R. 45; West Germany 18; East Germany 6.
Ferroalloys:			
Ferromanganese do	20	18	Norway 11; Republic of South Africa 2; West Germany 1.
Other do	48	45	Norway 8; Republic of South Africa 6; U.S.S.R. 5; Yugoslavia 5.
Steel:			
Primary forms do	r 69	107	Hungary 45; West Germany 19; East Germany 13.
Semimanufactures:			
Bars, rods, angles, shapes, and sections do	58	108	West Germany 64; Czechoslovakia 12; Hungary 7.
Universals, plates, and sheets do	67	90	West Germany 38; Belgium-Luxembourg 16; France 8.
Hoop and strip do	15	18	West Germany 9; Switzerland 3; Italy 2.
Rails and accessories do	2	2	West Germany 1.
Wire do	9	12	West Germany 3; Hungary 3; Belgium-Luxembourg 2.
Tubes, pipes, and fittings do	125	121	West Germany 78; Italy 8; Switzerland 6.
Castings and forgings, rough do	6	7	West Germany 5; Italy 1.
Lead:			
Ore and concentrates	3,350	6,090	All from Italy.
Oxides	61	72	United Kingdom 50; West Germany 19.
Metals, including alloys:			
Unwrought, including scrap	16,401	20,573	Yugoslavia 11,847; West Germany 3,558; Bulgaria 2,933.
Semimanufactures	492	553	Yugoslavia 308; Switzerland 169.
Magnesium metal, including alloys, all forms	2,765	3,944	Poland 2,913; Czechoslovakia 437; Norway 270.

See footnotes at end of table.

Table 3.—Austria: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS—Continued			
Manganese:			
Ore and concentrates	792	937	Netherlands 416; West Germany 260; Morocco 240.
Oxides	256	403	Japan 255; Belgium-Luxembourg 100.
Mercury 76-pound flasks	220	386	United Kingdom 87; Turkey 70; West Germany 49.
Molybdenum:			
Oxides	801	702	West Germany 652; East Germany 50.
Metal, including alloys, all forms	13	6	West Germany 2; United Kingdom 1; United States 1.
Nickel:			
Matte, speiss, and similar materials	2,088	799	United Kingdom 400; Netherlands 281.
Metal, including alloys:			
Unwrought, including scrap	2,149	2,512	United Kingdom 1,206; France 673; Netherlands 180.
Semimanufactures	959	798	West Germany 394; United Kingdom 296.
Platinum-group metals and silver metal, including alloys, all forms:			
Platinum group troy ounces	12,635	26,267	West Germany 14,950; Republic of South Africa 6,430; U.S.S.R. 3,215.
Silver:			
Bullion thousand troy ounces	3,495	2,739	West Germany 1,119; Mexico 1,000.
Other (powder) do	6	10	All from West Germany.
Semimanufactures do	624	727	West Germany 563; Switzerland 148.
Tin metal, including alloys, all forms long tons	685	665	Netherlands 409; West Germany 93; Indonesia 55.
Titanium oxide	6,546	7,264	West Germany 4,776; United Kingdom 1,614; Finland 354.
Tungsten:			
Ore and concentrate	3,199	3,703	NA.
Oxide and hydroxide	254	302	West Germany 166; France 128.
Metal, including alloys, all forms	67	229	United Kingdom 112; United States 57; West Germany 39.
Zinc:			
Ore and concentrate	11,431	5,750	All from Italy.
Oxide	711	688	West Germany 612.
Metal, including alloys:			
Scrap and blue powder	804	562	Yugoslavia 361; United Kingdom 105.
Unwrought	6,856	6,643	Poland 2,040; Bulgaria 1,400; Zambia 1,076.
Semimanufactures	179	531	Yugoslavia 421; West Germany 37.
Other:			
Ore and concentrate	15,985	24,671	Czechoslovakia 17,325; United States 2,719; Canada 1,344.
Ash and residue containing nonferrous metals	23,597	34,608	East Germany 13,157; Poland 7,435; West Germany 3,871.
Waste and sweepings of precious metals kilograms	10	805	Yugoslavia 795; West Germany 5.
Oxides, hydroxides and peroxides of metals, n.e.s	[r] 2,015	1,832	United States 752; Republic of South Africa 528; Netherlands 232.
Base metals, including alloys, all forms, n.e.s	1,017	1,002	Belgium-Luxembourg 203; Republic of South Africa 190; France 178; Yugoslavia 102.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum and other natural abrasives	1,737	792	West Germany 330; Italy 267; Netherlands 120.
Dust and powder of precious and semiprecious stones (including diamond) kilograms	41	14	West Germany 10; Switzerland 4.
Grinding and polishing wheels and stones	689	709	West Germany 389; United States 50; United Kingdom 45.
Asbestos	34,353	34,155	Canada 18,771; U.S.S.R. 5,832; Republic of South Africa 5,724.
Barite and witherite	8,460	8,214	West Germany 3,198; Yugoslavia 3,131; Czechoslovakia 1,384.
Boron materials:			
Crude natural borates	7,679	9,849	United States 7,275; Turkey 2,550.
Oxide and acid	301	742	Turkey 550; Netherlands 70.
Cement	20,303	22,687	France 5,503; Italy 5,473; West Germany 5,041.

See footnotes at end of table.

Table 3.—Austria: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
NONMETALS—Continued			
Chalk	2,828	2,823	France 2,192; West Germany 311.
Clays and products (including all refractory brick):			
Crude, n.e.s.:			
Bentonite	506	532	West Germany 454.
Kaolin (china clay)	39,462	48,029	United Kingdom 18,721; West Germany 18,409; Czechoslovakia 5,025.
Other	75,792	94,414	West Germany 52,927; Czechoslovakia 31,208; Poland 6,708.
Products:			
Refractory (including nonclay bricks)	12,086	13,673	West Germany 10,930.
Nonrefractory	118,490	119,441	West Germany 51,190; Italy 44,228; Switzerland 11,909.
Cryolite and chiolite, natural	416	358	All from Denmark.
Diamond, industrial___thousand carats	150	100	NA.
Diatomite and other infusorial earths	2,257	2,635	Hungary 927; United States 643; Denmark 243.
Feldspar	6,949	7,902	West Germany 3,972; Sweden 2,205; Italy 1,540.
Fertilizer:			
Crude:			
Phosphatic	305,866	333,673	Israel 114,442; United States 91,332; U.S.S.R. 69,074.
Potassic	59,475	57,925	East Germany 44,945; West Germany 12,980.
Other	1,949	2,547	West Germany 1,905; Switzerland 641.
Manufactured:			
Nitrogenous	4,310	6,419	West Germany 6,403.
Phosphatic	249,416	295,400	France 155,013; Belgium-Luxembourg 112,654; West Germany 26,823.
Potassic	237,271	258,552	East Germany 100,409; West Germany 80,528; U.S.S.R. 46,873.
Other, including mixed	7,996	1,890	West Germany 1,686; Belgium-Luxembourg 90.
Fluorspar	14,550	13,666	East Germany 8,129; Italy 2,219; West Germany 2,010.
Graphite, natural	592	1,775	North Korea 911; U.S.S.R. 340; West Germany 333.
Gypsum and plasters	22,277	13,256	West Germany 6,449; Poland 4,000; Switzerland 2,252.
Lime	693	1,449	West Germany 1,420.
Magnesite	65,438	106,703	Turkey 77,244; Greece 20,820.
Mica:			
Crude, including splittings and waste	300	299	Norway 111; United Kingdom 89; West Germany 88.
Worked, including agglomerated splittings	37	47	Switzerland 22; West Germany 13.
Pigments, mineral:			
Natural, crude	195	184	France 123; West Germany 15.
Iron oxides, processed	1,685	1,940	West Germany 1,926.
Precious and semiprecious stone, including diamond:			
Natural___thousand carats	67,530	81,105	Brazil 30,865; West Germany 13,790; Mozambique 9,420.
Manufactured___do	25,945	40,110	France 23,185; Switzerland 14,820.
Pyrite (gross weight)	26,226	19,119	U.S.S.R. 14,343; Greece 3,930.
Salt, including brine salt	13,349	1,959	West Germany 1,846.
Sand and gravel:			
Gravel (including crushed rock)	49,791	51,270	West Germany 38,289; Italy 10,579.
Sand excluding metal bearing	128,446	142,748	West Germany 101,817; East Germany 18,064; Czechoslovakia 12,420.
Stone, n.e.s.:			
Dimension stone:			
Crude and partly worked:			
Calcareous, including marble and limestone	9,277	10,454	Italy 7,687; West Germany 1,458.
Slate	830	891	West Germany 537; France 240.
Other	27,105	24,933	Italy 12,465; Republic of South Africa 6,130; Switzerland 2,386.
Worked:			
Paving and flagstone	11,213	8,870	Yugoslavia 6,740; Italy 1,862.
Slate	390	268	Italy 203; West Germany 62.
Other	4,011	4,378	Italy 3,589; West Germany 438; Switzerland 221.

See footnotes at end of table.

Table 3.—Austria: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
NONMETALS—Continued			
Stone, n.e.s.—Continued			
Dolomite, chiefly refractory grade	3,294	3,631	Italy 2,796; West Germany 508.
Limestone, except dimension	39	25	NA.
Quartz and quartzite	14,782	19,283	West Germany 13,368; Yugoslavia 4,171.
Volcanic material (trass)	494	782	All from West Germany.
Sulfur:			
Elemental, all forms	112,417	116,850	Poland 66,136; U.S.S.R. 24,166; France 9,771.
Sulfur dioxide	640	1,453	West Germany 1,098; Switzerland 354.
Sulfuric acid and oleum	14,074	11,294	Czechoslovakia 8,443; West Germany 1,157.
Talc, steatite, soapstone and pyrophyllite	1,414	1,049	Norway 555; Italy 198; West Germany 171.
Other nonmetals, n.e.s.:			
Crude:			
Meerschaum, amber, and jet	6	17	Turkey 6.
Other	27,135	32,327	West Germany 26,060; Bulgaria 2,612; Hungary 1,460.
Slag, dross and similar waste, not metal bearing	18,700	26,329	Hungary 11,085; Italy 6,775; Republic of South Africa 6,101.
Oxides and hydroxides of magnesium, strontium, and barium	515	559	West Germany 455; United States 86.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	507	710	Trinidad and Tobago 492; West Germany 144.
Carbon black and gas carbon	17,149	20,326	West Germany 8,236; Italy 5,852; Belgium-Luxembourg 3,903.
Anthracite and bituminous coal and briquets thousand tons	3,109	3,725	Poland 1,395; U.S.S.R. 896; West Germany 773.
Lignite and lignite briquets do	558	692	West Germany 285; East Germany 254; Yugoslavia 87.
Coke and semicoke do	1,070	1,082	Czechoslovakia 540; West Germany 240; U.S.S.R. 104.
Gas, hydrocarbon	645,294	727,501	U.S.S.R. 695,055; Czechoslovakia 22,760.
Hydrogen, helium and rare gases thousand cubic feet	51,009	50,710	West Germany 49,445.
Peat, including peat briquets and litter	15,617	16,800	West Germany 10,268; Poland 4,176.
Petroleum:			
Crude and partly refined oils:			
Crude thousand 42-gallon barrels	r 9,906	16,640	U.S.S.R. 6,407; Iraq 3,378; Libya 3,165.
Partly refined do	6,744	7,833	Czechoslovakia 2,272; Hungary 1,656; Romania 1,228.
Refinery products:			
Gasoline, aviation and motor do	7,148	8,474	Italy 2,835; West Germany 2,669; Hungary 1,472.
Kerosine do	1	2	Netherlands 1.
Distillate fuel oil do	770	925	Italy 591; West Germany 225; Yugoslavia 78.
Residual fuel oil do	12,158	19,932	West Germany 5,378; Italy 2,680; Switzerland 1,548.
Lubricants do	449	555	Italy 150; West Germany 133; Belgium-Luxembourg 63; Netherlands 63.
Mineral jelly and wax do	71	80	West Germany 44; East Germany 12; Hungary 12.
Other do	r 1,997	2,129	West Germany 951; Italy 711; Czechoslovakia 201.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	8,546	9,512	U.S.S.R. 3,058; Czechoslovakia 2,128; West Germany 1,973.

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r Revised. NA Not available.

[1] Includes spiegeleisen, shot, powder, and sponge.

COMMODITY REVIEW

METALS

Aluminum.—Production of primary aluminum in 1971 remained at about the same level as that of the preceding year. The country's two primary aluminum smelters continued to have the same combined capacity as in 1970. The state-owned Vereinigte Metallwerke Ranshofen-Berndorf A.G. (VMRB), by far the larger of the two smelters, produced about 80,000 tons, while the smaller reduction plant, Salzburger Aluminium G.m.b.H. (SAG), Lend, produced around 12,000 tons.

Norsk Hydro has formed a 90-percent-Austrian subsidiary, Aluminiumwerke Nenzing G.m.b.H., and plans to erect and operate an extrusion plant at Nenzing in Vorarlberg. An annual production capacity of 3,000 metric tons is planned and the facility is scheduled to go into operation before the end of 1972. Norway will supply the feed material.

The project for a new reduction plant of VMRB, previously reported in the 1970 Minerals Yearbook, has been held back because of the present worldwide aluminum surplus. Construction of the company's projected new cold-rolling mill should begin in 1972, with completion planned by 1974. It will provide an additional rolling capacity of 25,000 tons per year. The new aluminum powder plant, erected in 1971, is scheduled to go into operation early in 1972.

Low water levels reduced hydroelectric power in Austria, forcing VMRB to cut its production rate in November by 12 percent. The company's expansion plans require sufficient amounts of electric power at sufficiently low costs. Possible participation in a nuclear power station was being investigated by the company.

Antimony.—The government-owned Bleiberger Bergwerks-Union A.G. continued to operate the Schlaining mine in Burgenland province, the country's only antimony producer. Austria produced less than 1 percent of the world's total production of antimony metal. Crude ore production in Austria declined from 20,098 metric tons in 1970 to 18,519 metric tons in 1971.

Copper.—Austria continued to be a modest producer of copper ore, concentrate, and electrolytic copper in 1971. Output of copper (metal content of ore) was about 17 percent higher than that of 1970. A record level of production of more than 52,000 tons of copper and semifinished copper alloys was reached in 1971, owing to increased demand by the cable industry.

Iron and Steel.—The iron and steel industry remained one of the most important elements in the country's economy. Iron ore output in 1971 reached a record level of 4.17 million metric tons. Slight declines were shown in pig iron production, which decreased from 2,964,231 metric tons in 1970 to 2,849,124 metric tons in 1971 (−3.9 percent), and in crude steel production, which declined from 4,078,757 metric tons to 3,960,483 metric tons (−2.9 percent).

Österreichische Industrieverwaltungs A.G. (ÖIAG) announced in the latter part of 1971 a plan to merge the steel producer Österreichisch-Alpine Montangesellschaft A.G. (ÖAMG) and the special steel producers Gebrüder Böhler and Co. A.G. and Schoeller-Bleckmann into a singly administered corporate unit by fall of 1972. The remaining fourth company, Vereinigte Österreichische Eisen und Stahlwerke, A.G. (VÖEST), also may be included. Such a merger would create a large and broadly based new company.

Most of Austria's iron ore production came from the Erzberg (ore-mountain) mine near Eisenerz, Styria, with open pit methods providing the bulk of production. The Erzberg deposit is the largest accumulation of carbonatic iron ore—siderite with some ankerite—in the world.

Reserves of the visible and probable ore are estimated at about 227 million metric tons. The run of mine ore has a content of about 32 percent iron and 2 percent manganese, and is practically free of phosphorus and sulfur.

Lead and Zinc.—The government-owned Bleiberger Bergwerks-Union A.G. increased production at its Bleiberg-Kreuth workings in Carinthia from 219,407 metric tons of lead and zinc ore in 1970 to a new alltime high of 381,732 metric tons in 1971 (+74 percent). Production in terms of the lead content of ore increased from 6,003 metric tons in 1970 to 7,715 metric tons in 1971; production of metal content of zinc ore increased from 15,707 metric tons to 21,073 metric tons. For the first time it has become possible for the company to feed its Arnoldstein zinc works entirely with its own blend.

Other Metals.—During 1971 Austria also produced cadmium, germanium, silver, and tungsten. A substantial part of the metals production was based on imported ores, concentrates and raw metals.

NONMETALS

Graphite.—Crude graphite production in 1971 was 21,392 metric tons, a decrease of about 23 percent from the 27,733 metric tons produced in 1970. In recent years output has consisted of higher grade material. The peak year of Austrian graphite production was in 1964, when 102,237 metric tons of crude graphite was produced, about three-fourths of which was low-grade, mine-run material from Lower Austria.

Gypsum and Anhydrite.—Austria produced 593,719 metric tons of crude gypsum and anhydrite in 1971, a decrease of more than 5 percent from the 627,832 metric tons produced in 1970. A new gypsum plant, to be operated by Rigips Baustoffwerke, is to be built at Bad Aussee in Styria. The company is owned by the West German company in conjunction with Austrian interests that include Österreichische Stickstoffwerke A.G. (ÖSW). The plant is expected to produce about 100,000 tons per year of gypsum and up to 14.5 million square yards of plasterboard per year.

Magnesite.—Output of crude magnesite in 1971 decreased 3.3 percent from 1,609,340 metric tons in 1970 to 1,556,459 metric tons; sintered or dead-burned magnesite decreased from 546,326 metric tons to 507,771 metric tons; but caustic-calcined magnesite increased from 180,307 metric tons to 190,868 metric tons. Breitenau, Hochfilzen, and Radenthein again were the principal producing mines. Wald am Schoberpass, Preg, and Leogang discontinued production in 1970. A significant part of the Austrian magnesite production was exported.

Talc.—Talc and soapstone production decreased by 8.5 percent from 1970; production came almost exclusively from the province of Styria.

Other Nonmetals.—In 1971, Austria also produced a variety of other nonmetals including barite, kaolin, illite, quartz and quartzite, diatomite, feldspar, salt, and pumice (trass).

MINERAL FUELS

Austria in 1971 continued to be a modest producer of low-rank coals, crude oil, and natural gas. Indigenous production was not adequate to meet the country's requirements, and imports were necessary to satisfy the demand for energy. Hydroelectric power stations were handicapped by low water levels, and in November, for the first time in its history, Austria imported more electric power than it exported.

Coal.—Total delivery of solid mineral fuels (including coke produced from imported coal) to the domestic market in 1971 was 7.3 million tons of standard bituminous coal equivalent, a decrease of 1.2 million tons or 14.2 percent from the total of the preceding year. The total share of solid mineral fuels in the overall energy supply continued to decline, despite the fact that Austria's total energy consumption again increased. Major reasons for the decline in consumption of solid mineral fuels were reduced demand by coking plants, railways, households, and other industrial uses, and the replacement by other forms of energy in these and other consumer groups. High retail prices for coke and other solid fuels in 1971 accelerated this replacement trend.

Compared with the 1970 total, Austrian coal production increased about 2.7 percent. To meet its coal and coke requirements, however, Austria depended on imports. All of its bituminous coal requirements were obtained from foreign sources. Imports of lignitic coals (including subbituminous and lignite briquets) accounted for 14.7 percent of total internal deliveries. Coke deliveries in 1971 were reduced to 2.5 million tons from the previous year's 2.8 million tons. Austria's coke requirements were supplied from local sources using imported coal exclusively and by coke imports, which in 1971 amounted to 883,000 tons. Countries that supplied the imports of solid mineral fuels were Czechoslovakia (28 percent), Poland (27 percent), the Soviet Union (20 percent), West Germany (15 percent), East Germany (6 percent), Yugoslavia (2 percent), and other countries (2 percent). Austria did not import coal from the United States in 1971.

Petroleum and Natural Gas.—Crude oil production in Austria decreased from 2,798,237 metric tons in 1970 to 2,515,879 metric tons in 1971, a decline of 10 percent. Natural gas production decreased only slightly from 1,897,991,000 cubic meters in 1970 to 1,891,289,000 cubic meters in 1971.

Drilling activities for hydrocarbons continued. Österreichische Mineralölverwaltung A.G. (ÖMVAG), the Austrian state corporation, was the most active operator and the major holder of concessions (21,716 square kilometers), mainly in the Molasse and Vienna basins in Lower Austria; the company has a concession area in Burgenland on which it has been conducting seismic surveys. Rohoel-Gewinnungs A.G. (RAG), a joint subsidiary of Shell Austria A.G. and Mobil Austria A.G., held concessions covering 6,419 square kilometers, largely in the Molasse and Graz basins in Upper Austria and Styria, but including a small producing area in the Vienna basin. Other small areas were held by Tiefbohrunternehmen R. K. Van Sickle and by Vorarlberger Erdöl und Erdgas G.m.b.H. The latter two companies were not active in exploration.

Petrochemicals.—In the chemical and crude oil producing and processing industry, ÖIAG was successful in combining the petrochemical activities of ÖSW and ÖMVAG in a petrochemical firm jointly owned by the two nationalized enterprises.

The Mineral Industry of Belgium and Luxembourg

By Frank L. Fisher[1]

The mineral industry of Belgium-Luxembourg continued to focus on processing imported raw materials in the ferrous, nonferrous, and petroleum areas. The petroleum industry and its chemical offshoots dominated the raw material processing industry. Belgium has no major indigenous sources of mineral raw materials and depends primarily on imports for its supply of the mineral items processed in the country. France is a major supplier of imported mineral raw materials. The mineral industry, in general, showed no established trend over the previous year except that production was down slightly with no established pattern in the metals, nonmetals, or mineral fuels sectors.

The gross national product (GNP) for the year increased 10.7 percent over 1970. Employment was at a high level as industrial production and growth continued to increase.

Among the Belgian industries reporting increased foreign investments were nonferrous metals, metal fabrication, and oil refineries.

BELGIUM

PRODUCTION

Belgium relies almost solely on imports of metal and mineral raw materials with the exception of certain nonmetallic construction materials. The general pattern of imports, production, and consumption followed the pattern of 1970. In the metals industry there was a very moderate decline with the exception of tin, which showed a slight increase. Quantities for nonmetals were mixed and those of mineral fuels were down approximately 10 percent. Production statistics for petroleum refinery products were not available.

Table 1.—Belgium: Production of mineral commodities
(Metric tons unless otherwise specified)

Commodity[1]	1969	1970	1971[p]
METALS			
Aluminum metal, secondary only[e]	2,500	2,500	2,500
Cadmium	[r] 949	1,093	947
Copper metal, refined including secondary	298,675	351,710	325,866
Iron and steel:			
Iron ore and concentrate thousand tons	[r] 93	94	93
Pig iron including ferroalloys do	11,313	10,844	10,403
Steel:			
Crude do	12,832	12,607	12,443
Semimanufactures do	10,719	10,337	10,167
Lead metal including secondary	110,543	106,024	93,925
Tin metal including secondary long tons	6,474	5,640	6,300
Zinc metal including secondary	260,593	241,237	212,707
Other nonferrous metals:			
Precious metals unworked, not further specified[2] thousand troy ounces	46,851	31,259	[e] 28,600
Unspecified base metals[3]	[r] 3,714	3,352	[e] 2,300

See footnotes at end of table.

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[1] Physical scientist, Division of Ferrous Metals.

Table 1.—Belgium: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity [1]	1969	1970	1971 [p]
NONMETALS			
Abrasives, natural, whetstones (crude) [4]	[r] 30	25	• 12
Cement, hydraulic thousand tons	6,269	6,729	6,981
Clays n.e.s do	220	198	206
Fertilizer materials manufactured:			
Nitrogenous, nitrogen content do	427	397	413
Phosphatic, gross weight:			
Thomas slag do	1,534	1,300	1,288
Superphosphate do	204	157	152
Other do	475	487	545
Gypsum and anhydrite, calcined	78,972	87,963	96,430
Lime and dead-burned dolomite:			
Quicklime thousand tons	2,629	2,519	2,652
Dead-burned dolomite do	388	372	351
Stone, sand and gravel:			
Calcareous:			
Marble:			
In blocks cubic meters	4,761	3,323	2,560
Crushed and other	21,931	20,699	14,751
Limestone and dolomite thousand tons	19,233	22,931	25,531
Petit granite (Belgian bluestone):			
Quarried cubic meters	301,161	337,934	331,072
Sawed do	73,052	71,234	66,242
Worked do	11,956	11,744	17,638
Crushed and other do	241,273	278,907	300,072
Porphyry, all types thousand tons	6,757	7,486	8,395
Quartzite [4]	391,404	332,676	427,256
Sand and gravel:			
Construction sand thousand tons	5,532	6,705	8,908
Foundry sand do	1,354	1,537	1,397
Dredged sand do	860	921	703
Glass sand do	1,825	1,840	1,549
Other sand do	1,465	1,775	1,959
Gravel (dredged) do	5,146	4,269	4,332
Sandstone:			
Rough stone including crushed do	1,554	1,763	2,066
Paving and mosaic stone	5,726	2,779	1,981
Other	67,045	50,274	44,181
Slate, roofing and other	8,856	7,194	7,278
Sulfur, byproduct recovered •	[r] 8,500	8,500	7,982
MINERAL FUELS AND RELATED MATERIALS			
Coal:			
Anthracite thousand tons	[r] 4,247	3,686	3,371
Bituminous do	[r] 8,953	7,676	7,589
Total do	13,200	11,362	10,960
Coke, all types do	7,250	7,068	6,784
Fuel briquets, all kinds do	792	747	576
Gas manufactured million cubic feet	[r] 88,923	73,189	• 65,500
Petroleum refinery products:			
Gasoline, aviation thousand 42-gallon barrels	18	9	NA
Gasoline, motor do	26,095	30,405	
Jet fuel do	8,384	8,512	
Kerosine do	922	1,023	
Distillate fuel oil do	67,588	70,303	
Residual fuel oil do	68,711	74,998	
Lubricants do	378	378	
Other do	22,924	21,097	
Refinery fuel and losses do	16,539	14,656	
Total do	211,559	221,381	NA

• Estimate. p Preliminary. r Revised. NA Not available.

[1] In addition to the commodities listed individually, Belgium produces a number of other metals for which only aggregate output figures are available. These aggregates are listed under other nonferrous metals.

[2] Known to include gold and silver and may include platinum-group metals.

[3] Figure for 1969 derived by subtracting estimated or approximate data for aluminum and cadmium from a reported total for unspecified base metals; 1970 and 1971 data derived by subtracting estimated or approximate data for aluminum only.

[4] Erroneously reported in past years as thousands.

TRADE

Belgium and Luxembourg combine their trade and economic statistics under the Belgium-Luxembourg Economic Union (BLEU). During 1971, trade remained above normal as the growth rate in most industry segments increased. Belgium was reported to have a deficit trade with a total deficit for BLEU of $208 million.[2] Trade with BLEU was reported to be restricted by a lack of hard currency, and limited markets. In an effort to stimulate trade, the Belgian export tax was reduced in September and applied to iron and steel articles. The tax was reduced from 1.75 to 1 percent on iron and steel items.

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[2] Where necessary, values have been converted from Belgium Francs (BF) to U.S. dollars at the rate of BFs=US$1.00.

Table 2.—Belgium-Luxembourg: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum:			
Bauxite and concentrate	182	73	NA.
Oxide and hydroxide	17	18	NA.
Metal including alloys:			
Scrap	13,610	13,799	France 6,221; West Germany 4,600; Netherlands 1,918.
Unwrought	10,509	10,147	West Germany 7,794; Sweden 450; Netherlands 293.
Semimanufactures	r 131,873	132,618	West Germany 29,052; United States 21,799; France 17,988.
Arsenic, natural sulfides	16	--	
Bismuth metal including alloys	192	341	France 171; Netherlands 114.
Cadmium metal including alloys	1,037	1,020	West Germany 547; France 250.
Chromium:			
Chromite	50	--	
Oxide and trioxide	104	23	NA.
Metal including alloys, all forms	(1)	42	NA.
Copper:			
Ore and concentrate	1,247	922	All to Canada.
Metal including alloys, all forms:			
Scrap	18,197	16,848	West Germany 8,881; Netherlands 3,200; Italy 2,356.
Unwrought	260,974	324,958	France 113,124; West Germany 72,003; Netherlands 44,241.
Semimanufactures	107,944	112,906	Netherlands 36,780; West Germany 33,923; France 4,055.
Germanium metal including alloys, all forms kilograms	7,000	12,000	Italy 4,200; Hungary 2,000; West Germany 1,300.
Gold metal unworked and partly worked thousand troy ounces	499	223	United States 73; United Kingdom 55.
Iron and steel:			
Ore and concentrate except roasted pyrite thousand tons	66	49	France 20; West Germany 16; United Kingdom 10.
Roasted pyrite do	224	287	West Germany 286.
Metal:			
Scrap do	690	741	West Germany 293; Netherlands 219; France 93.
Pig iron including cast iron do	57	23	France 21.
Sponge iron, powder and shot do	2	1	Mainly to France.
Ferroalloys do	71	74	West Germany 30; Italy 20; France 17.
Steel, primary forms do	1,838	1,933	France 877; West Germany 488; Italy 181.
Semimanufactures:			
Bars, rods, angles, shapes, sections do	5,173	5,291	West Germany 1,556; France 933; United States 723.
Universals, plates, and sheets do	4,152	3,968	West Germany 1,199; France 1,082; Netherlands 451.
Hoop and strip do	950	891	West Germany 285; France 235; Netherlands 79.
Rails and accessories do	108	83	Italy 13; France 12; Netherlands 12.
Wire do	408	398	United States 90; West Germany 74; Netherlands 53.
Tubes, pipes and fittings do	244	255	West Germany 76; Netherlands 58; France 41.
Castings and forgings do	32	34	West Germany 10; France 6; Netherlands 5.

See footnotes at end of table.

Table 2.—Belgium-Luxembourg: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS—Continued			
Lead:			
Ore and concentrate	1,322	34,383	France 31,402; Netherlands 2,951.
Oxides	6,137	7,570	Netherlands 5,027; West Germany 1,248.
Metals:			
Scrap	12,072	7,763	France 3,732; West Germany 2,602; Netherlands 1,360.
Unwrought	53,557	63,722	Netherlands 16,950; France 13,575; West Germany 9,781.
Semimanufactures	6,389	5,596	Switzerland 594; Norway 301; Zaire (formerly Congo Kinshasa) 125.
Magnesium metal including alloys, all forms	255	303	United States 102; West Germany 74; United Kingdom 30.
Manganese:			
Ore and concentrate	11,350	13,104	United Kingdom 9,565; West Germany 2,195.
Metal, all forms	7	21	West Germany 20.
Mercury 76-pound flasks	r 531	589	France 203; West Germany 203.
Nickel:			
Matte, speiss, and similar materials	251	178	West Germany 176; France 2.
Metal including alloys:			
Scrap	859	802	West Germany 250; France 178; Netherlands 151.
Unwrought	481	205	West Germany 97; Netherlands 39; France 35.
Semimanufactures	849	490	West Germany 141; Israel 140; France 65.
Platinum-group metals including alloys, all forms thousand troy ounces	46	67	West Germany 36; France 20; Netherlands 4.
Selenium, elemental kilograms	20,700	30,700	Netherlands 18,400; West Germany 5,000.
Silver metal unworked or partly worked thousand troy ounces	r 45,104	26,272	France 4,068; Portugal 3,139.
Tin:			
Ore and concentrate long tons	856	581	United Kingdom 419; Spain 161.
Oxide do	371	266	West Germany 100; France 58; Netherlands 53.
Metal:			
Scrap do	123	109	Netherlands 65; West Germany 16; Denmark 15.
Unwrought do	3,883	3,052	Netherlands 958; France 911; West Germany 616.
Semimanufactures do	42	52	West Germany 18; France 10; Switzerland 9.
Titanium:			
Ore and concentrate	147	3,529	NA.
Oxide	5,368	23,501	West Germany 7,481; United States 4,758; France 3,570.
Metal including alloys, all forms	5	16	Netherlands 2; West Germany 1.
Tungsten:			
Ore and concentrate	46	64	Netherlands 32; United Kingdom 11; West Germany 9.
Metal including alloys, all forms	r (1)	9	NA.
Zinc:			
Ore and concentrate	55,772	194,549	France 143,755; Netherlands 406.
Metal including alloys:			
Scrap	8,339	8,786	France 8,218.
Blue powder	27,677	31,972	West Germany 12,194; United States 4,242; France 3,598.
Unwrought	155,511	137,291	West Germany 74,701; France 13,092; United States 11,347.
Semimanufactures	15,535	13,186	France 3,545; Netherlands 2,532; West Germany 1,917.
Other:			
Ore and concentrate	r 12,754	12,470	West Germany 5,243; France 4,460; United States 309.
Ash and residue containing nonferrous metals:			
Lead	5,514	13,419	Netherlands 10,819; West Germany 2,278; France 316.
Zinc	r 47,191	45,012	Netherlands 32,421; West Germany 5,819; France 2,245.
Other	11,522	11,781	West Germany 6,456; Netherlands 2,039; France 1,840.
Oxides, hydroxides and peroxides of metals n.e.s	3,346	2,711	France 722; West Germany 663; United States 214.
Base metals including alloys, all forms n.e.s	14,407	13,560	United States 4,323; Japan 3,416; West Germany 1,093.

See footnotes at end of table.

Table 2.—Belgium-Luxembourg: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
NONMETALS			
Abrasives, natural, pumice, emery, natural corundum	389	1,762	NA.
Asbestos	230	952	France 539; West Germany 382.
Barite and witherite	r 93	170	NA.
Boron materials:			
Crude natural borates	515	2,155	Netherlands 2,000.
Oxide and acid	61	78	NA.
Cement thousand tons	r 1,400	1,626	Netherlands 987; West Germany 164; Cameroon 56.
Chalk	108,536	103,364	Netherlands 81,002; West Germany 6,085; Pakistan 2,111.
Clays and products (including all refractory brick):			
Crude n.e.s.:			
Bentonite	87	378	NA.
Kaolin	1,456	10,641	Netherlands 4,934; Republic of South Africa 2,869; France 2,134.
Other	6,675	10,740	Netherlands 7,727; France 1,764.
Products:			
Refractory (including nonclay bricks)	75,432	89,988	France 57,260; Netherlands 10,498; West Germany 9,952.
Nonrefractory	138,948	145,384	Netherlands 76,105; West Germany 35,763; France 27,841.
Cryolite and chiolite	--	294	NA.
Diamond:			
Gem not set or strung thousand carats	5,479	5,796	India 2,223; Israel 916; United States 707.
Industrial do	9,753	8,140	United Kingdom 2,281; United States 1,860; Switzerland 1,205.
Diatomite and other infusorial earths	399	839	NA.
Fertilizer materials:			
Crude:			
Nitrogenous	157	699	NA.
Phosphatic	11,999	7,882	Switzerland 1,759; United Kingdom 1,435; Netherlands 1,058.
Potassic	6,927	31,277	NA.
Other	8,276	7,377	Netherlands 3,171; West Germany 2,163.
Manufactured:			
Nitrogenous thousand tons	828	976	West Germany 268; France 214; People's Republic of China 177.
Phosphatic do	1,948	1,844	France 761; West Germany 405; Ireland 155.
Potassic do	644	668	United Kingdom 79; France 71; Norway 69.
Other including mixed do	1,140	1,188	France 657; West Germany 150; Turkey 69.
Ammonia do	r 227	132	France 108.
Fluorspar	37	539	NA.
Graphite, natural	11	31	NA.
Gypsum and plasters	12,403	9,467	Netherlands 8,880.
Lime thousand tons	489	577	Netherlands 452; France 56; Ivory Coast 22.
Mica:			
Crude including waste	58	101	NA.
Worked including agglomerated splittings	468	519	United Kingdom 158; West Germany 98; Switzerland 66.
Pigments, mineral including processed iron oxides	r 440	3,194	France 209; West Germany 57; United Kingdom 52.
Precious and semiprecious stones except diamond:			
Natural thousand carats	72,701	93,303	United States 42,020; United Kingdom 8,352; West Germany 415.
Manufactured do	r 323	414	Japan 88; Switzerland 59; Ireland 29.
Dust and powder (including synthetics) do	985	2,312	United Kingdom 587; West Germany 449; Israel 270.
Pyrite (gross weight)	20	1,456	NA.
Salt and brine	6,793	7,083	France 6,796.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous thousand tons	961	1,148	Netherlands 1,107.
Slate do	1	1	Mainly to Netherlands.
Other do	430	390	Netherlands 379.
Worked:			
Slate do	2	1	Mainly to West Germany.
Paving and flagstone do	3	3	Netherlands 1; West Germany 1; France 1.
Other do	8	8	Netherlands 3; West Germany 2; France 1.

See footnotes at end of table.

Table 2.—Belgium-Luxembourg: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
NONMETALS—Continued			
Stone, sand and gravel—Continued			
Dolomite, chiefly refractory grade thousand tons	874	931	Netherlands 614; France 158.
Gravel and crushed rock do	6,569	6,904	France 3,956; Netherlands 2,296; West Germany 397.
Limestone (except dimension) do	726	677	NA.
Quartz and quartzite do	39	22	West Germany 14; Netherlands 3; Mexico 1.
Sand excluding metal bearing do	3,096	2,887	France 691; Italy 595; West Germany 308.
Sulfur:			
Elemental, all forms	[r] 5,758	6,492	Pakistan 819; Netherlands 477; Venezuela 476.
Sulfuric acid	93,805	156,586	France 107,694; West Germany 19,318; Netherlands 18,362.
Talc, steatite, and pyrophyllite	14,345	15,913	Sweden 3,561; France 2,180; West Germany 2,116.
Other nonmetals n.e.s.:			
Crude, meerschaum, amber, jet	22	376	NA.
Slag, dross and similar waste not metal bearing thousand tons	[r] 2,585	2,909	Netherlands 1,631; France 778; West Germany 488.
Oxides and hydroxides of magnesium, strontium, and barium	470	247	France 100.
Building materials of asphalt, asbestos, and fiber cement and unfired nonmetals, etc	229,047	247,199	Netherlands 107,584; France 48,306; West Germany 32,848.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	112	1,332	Netherlands 856; West Germany 270; Algeria 113.
Carbon black and gas carbon	[r] 4,583	5,517	France 625; United Kingdom 87.
Coal and briquets:			
Anthracite and bituminous coal thousand tons	923	590	West Germany 364; France 135.
Briquets of anthracite and bituminous coal do	119	93	France 49; Austria 24; West Germany 14.
Coke and semicoke do	382	507	Sweden 111; France 90; West Germany 68.
Hydrogen, helium and rare gases	2,337	4,935	United Kingdom 1,689; France 1,151; West Germany 1,087.
Peat including briquets and litter	300	609	NA.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	240	178	West Germany 153.
Refinery products:			
Gasoline do	19,193	17,603	West Germany 6,318; United Kingdom 4,272; Netherlands 2,149.
Kerosine do	6,409	6,166	West Germany 1,617; Netherlands 954; United Kingdom 953.
Distillate fuel oil do	24,133	19,463	Sweden 3,338; Netherlands 1,599; Norway 935.
Residual fuel oil do	30,723	27,066	Sweden 3,837; United Kingdom 2,785; Netherlands 1,625.
Lubricants do	1,434	1,853	Netherlands 576; Sweden 224; Switzerland 153.
Mineral jelly and wax do	2	4	NA.
Other:			
Liquefied petroleum gas do	1,389	1,523	United Kingdom 407; Spain 387; Brazil 174.
Nonlubricating oils n.e.s do	1,436	1,848	Netherlands 569; Sweden 233; Switzerland 153.
Pitch coke and petroleum coke do	598	422	Netherlands 101; Norway 89; United Kingdom 63.
Bitumen and other residues do	1,750	1,934	Netherlands 917; United Kingdom 391; West Germany 304.
Bituminous mixtures n.e.s do	135	44	Netherlands 20; France 5.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	[r] 118,685	151,572	West Germany 61,515; Netherlands 35,639; United States 30,105.

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[r] Revised. NA Not available.
[1] Less than ½ unit.

Table 3.—Belgium-Luxembourg: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum:			
Bauxite and concentrate	17,379	12,865	Guyana 6,447; French Guiana 2,663.
Oxide and hydroxide	12,966	12,902	West Germany 11,170; France 833.
Metals including alloys:			
Scrap	4,778	6,461	Netherlands 2,766; United States 872; France 845.
Unwrought	176,452	185,009	France 50,847; United States 31,098; Norway 25,707.
Semimanufactures	28,889	30,225	West Germany 16,037; Netherlands 5,649; France 5,402.
Antimony:			
Ore and concentrate	r 8,881	6,520	Republic of South Africa 2,610; Bolivia 1,877; Morocco 1,030.
Metal including alloys, all forms	47	4	NA.
Beryllium metal including alloys, all forms kilograms	300	500	NA.
Bismuth metal including alloys, all forms	r 192	341	France 171; Netherlands 114.
Cadmium metal including alloys, all forms	764	719	Zaire (formerly Congo-Kinshasa) 311; U.S.S.R. 110; Netherlands 71.
Chromium:			
Chromite	17,770	18,546	Republic of South Africa 17,516.
Oxide and hydroxide	568	574	West Germany 395; France 121.
Metal including alloys, all forms	57	73	United Kingdom 34; France 26.
Cobalt oxides and hydroxides kilograms	--	1,700	NA.
Copper:			
Ore and concentrate	12,044	21,222	Chile 13,905; Ireland 2,170; Argentina 728.
Metal including alloys:			
Scrap	85,168	115,125	United States 52,689; France 17,989; Netherlands 16,209.
Unwrought	346,854	384,748	Zaire (formerly Congo-Kinshasa) 264,672; West Germany 1,392.
Semimanufactures	12,293	12,924	West Germany 6,703; Netherlands 2,170; France 928.
Germanium metal including alloys	26	14	Netherlands 12.
Gold metal unworked or partly worked thousand troy ounces	r 1,644	623	Switzerland 225; Zaire (formerly Congo-Kinshasa) 185; United Kingdom 160.
Iron and steel:			
Ore and concentrate except roasted pyrite thousand tons	27,643	29,169	France 13,607; Sweden 8,492; Brazil 1,653.
Roasted pyrite do	126	156	France 124; West Germany 31.
Metal:			
Scrap do	578	836	France 344; West Germany 297; Netherlands 135.
Pig iron including cast iron do	214	234	West Germany 112; France 60; East Germany 31.
Spiegeleisen do	21	18	West Germany 14; France 3.
Sponge iron, powder and shot do	6	6	West Germany 2; France 1; Sweden 1.
Ferroalloys do	140	153	France 69; Norway 55; West Germany 13.
Steel, primary forms do	868	1,068	Netherlands 287; France 248; United States 210.
Semimanufactures:			
Bars, rods, angles, shapes, sections do	529	567	France 259; West Germany 165; Netherlands 54.
Universals, plates and sheets do	486	500	West Germany 213; France 116; Netherlands 64.
Hoop and strip do	55	46	West Germany 20; France 17; Netherlands 7.
Rails and accessories do	9	6	France 3; West Germany 2.
Wire do	14	17	West Germany 7; France 5; Netherlands 3.
Tubes, pipes, and fittings do	124	141	West Germany 55; Netherlands 51; France 23.
Castings and forgings, rough do	10	9	France 4; West Germany 4.
Lead:			
Ore and concentrate	130,280	194,364	Ireland 54,957; Canada 50,840; Peru 26,887.
Oxide	3,285	3,816	Netherlands 2,075; West Germany 701; France 541.
Metal:			
Scrap	10,829	13,713	Netherlands 5,776; West Germany 3,993; Australia 864.
Unwrought	14,915	17,000	West Germany 5,057; United Kingdom 3,747; Mexico 1,378.
Semimanufactures	917	852	West Germany 606; Netherlands 121.

See footnotes at end of table.

Table 3.—Belgium-Luxembourg: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS—Continued			
Magnesium metal including alloys:			
Scrap	37	124	NA.
Unwrought	1,140	1,612	United States 546; Italy 285; U.S.S.R. 254.
Semimanufactures	89	81	United States 21; Netherlands 10; West Germany 9.
Manganese:			
Ore and concentrate	362,522	349,780	Zaire (formerly Congo-Kinshasa) 138,547; Republic of South Africa 115,986.
Oxides	604	573	Netherlands 349; Japan 152.
Metal	233	175	Republic of South Africa 123; France 42.
Mercury 76-pound flasks	r 7,214	3,536	Spain 2,045; Yugoslavia 574; Netherlands 209.
Molybdenum metal including alloys, all forms	10	13	Netherlands 6; Austria 2.
Nickel:			
Matte, speiss, and similar materials	61	33	Canada 29; U.S.S.R. 3.
Metal including alloys, all forms:			
Scrap	2,185	2,459	United States 1,053; France 405; Netherlands 383.
Unwrought	1,746	2,650	United Kingdom 1,047; Norway 667; France 235.
Semimanufactures	1,579	1,278	United Kingdom 499; West Germany 268; France 210.
Platinum-group metals including alloys, all forms troy ounces	43,476	39,461	United Kingdom 21,716; France 8,189.
Rare-earth metals including alloys	r 108	94	France 63.
Selenium, elemental kilograms	6,200	52,700	United States 47,800; Netherlands 1,900.
Silver:			
Waste and sweepings value, thousands	$8,985	$16,669	United States $14,048; Netherlands $2,169.
Metal including alloys thousand troy ounces	19,596	14,461	Netherlands 8,829; United States 1,366; Canada 910.
Tin:			
Ore and concentrate long tons	5,556	5,906	Zaire (formerly Congo-Kinshasa) 4,457; Rwanda 1,144.
Oxides do	7	7	NA.
Metal including alloys:			
Scrap do	19	23	United Kingdom 4.
Unwrought do	r 3,332	2,741	Zaire (formerly Congo-Kinshasa) 1,349; Netherlands 832.
Semimanufactures do	r 160	262	Netherlands 181; France 21.
Titanium:			
Ore and concentrate	47,309	61,954	Canada 59,622; Australia 1,839; Netherlands 464.
Oxide	10,745	10,158	West Germany 5,673; Netherlands 1,795.
Metal including alloys, all forms	16	540	U.S.S.R. 276; United States 229.
Tungsten:			
Ore and concentrate	36	125	Zaire (formerly Congo-Kinshasa) 78; Australia 31.
Metal including alloys, all forms	r 30	62	West Germany 26; Netherlands 15.
Zinc:			
Ore and concentrate	558,708	617,863	Canada 409,491; Zaire (formerly Congo-Kinshasa) 37,304; Sweden 33,667.
Oxide and peroxide	3,895	5,876	France 1,855; Netherlands 1,566; United Kingdom 1,166.
Metal including alloys:			
Scrap	1,370	2,165	West Germany 1,395; Netherlands 404; Switzerland 106.
Blue powder	1,317	1,255	West Germany 1,023; France 101.
Unwrought	41,659	29,226	Zaire (formerly Congo-Kinshasa) 12,591; Australia 4,417.
Semimanufactures	188	392	Netherlands 97; France 93; West Germany 68.
Other:			
Ore and concentrate	4,244	12,317	Zaire (formerly Congo-Kinshasa) 6,054; Mozambique 2,708; Republic of South Africa 1,518.
Ash and residue of nonferrous metals	242,446	270,820	West Germany 136,306; France 24,142; United States 19,395.
Oxides, hydroxides and peroxides of metals n.e.s	4,298	4,114	West Germany 1,173; Netherlands 719; France 488.
Metal including alloys, all forms:			
Alkali, alkaline earth metals	7	18	NA.
Pyrophoric alloys	4	6	Austria 2; United Kingdom 2.
Base metals including alloys, all forms n.e.s	10,767	13,014	Zaire (formerly Congo-Kinshasa) 12,827; United States 64.

See footnotes at end of table.

Table 3.—Belgium-Luxembourg: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
NONMETALS			
Abrasives, natural	165,419	196,641	West Germany 192,337; Netherlands 203; Italy 194.
Asbestos	64,723	54,839	Canada 30,627; Republic of South Africa 7,545.
Barite and witherite	6,101	6,464	France 3,901; West Germany 2,231.
Boron materials, crude natural borates	22,226	36,749	Netherlands 24,288; Turkey 8,319.
Cement	48,395	50,564	West Germany 26,225; Netherlands 11,117; France 8,954.
Chalk	79,771	80,908	France 45,752; Netherlands 34,417.
Clays and products:			
Crude:			
Bentonite	8,314	9,410	West Germany 4,414; Netherlands 1,217; United States 981.
Kaolin	182,728	229,848	United Kingdom 89,352; West Germany 64,668; Netherlands 46,292.
Other	298,588	306,678	West Germany 167,344; France 54,004; Czechoslovakia 10,069.
Products:			
Refractory (including nonclay bricks)	130,581	133,333	West Germany 69,960; Austria 18,808; France 18,596.
Nonrefractory	223,426	226,861	Netherlands 101,047; West Germany 66,488; Italy 27,930.
Cryolite and chiolite	328	436	Denmark 409.
Diamond:			
Gem not set or strung thousand carats	[r]10,989	9,796	United Kingdom 6,483; India 594; Israel 138.
Industrial do	[r]20,608	8,217	United Kingdom 4,145; Ireland 1,120; Switzerland 757.
Diatomite and other infusorial earths	4,230	5,325	United States 1,709; France 1,588; Denmark 980.
Fertilizer materials:			
Crude:			
Nitrogenous	23,481	12,577	Chile 12,549.
Phosphatic thousand tons	1,840	1,900	Morocco 1,156; United States 366; U.S.S.R. 158.
Potassic	67,199	63,155	France 39,988; West Germany 23,167.
Other	19,300	17,649	Netherlands 14,981.
Manufactured:			
Nitrogenous	278,933	210,903	France 91,959; West Germany 74,926; Netherlands 24,198.
Phosphatic	19,512	10,124	United States 3,332; Morocco 2,751; West Germany 2,220.
Potassic thousand tons	1,098	1,178	France 602; West Germany 225; U.S.S.R. 166.
Other including mixed	164,022	154,877	France 122,894; West Germany 17,959; Netherlands 11,289.
Fluorspar	67,492	74,175	Norway 29,438; France 21,989; Netherlands 7,934.
Graphite, natural	874	719	France 283; West Germany 128; United Kingdom 65.
Gypsum and plasters	458,723	488,583	France 412,001.
Lime	[r]160,538	187,437	France 142,978; West Germany 3,792.
Magnesite	[r]8,580	8,712	Brazil 2,420; Czechoslovakia 1,757; Austria 1,703.
Mica, all forms	3,035	2,262	India 915; United Kingdom 437; Malagasy Republic 264.
Pigments, mineral including processed iron oxides	8,100	8,168	West Germany 7,343.
Precious and semiprecious stones except diamond:			
Natural kilograms	5,183	1,333	West Germany 355; Brazil 168; United States 50.
Manufactured do	1,697	2,408	United States 2,211; Ireland 108.
Pyrite (gross weight)	[r]393,145	407,724	Portugal 196,607; Spain 138,118.
Salt and brine thousand tons	1,165	1,414	West Germany 723; Netherlands 630; France 33.
Sodium and potassium compounds n.e.s.	[r]32,436	34,199	Sweden 8,608; Netherlands 7,420; France 3,686.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	134,387	153,776	France 49,276; Italy 18,098; Portugal 14,955.
Worked	40,458	31,022	Portugal 4,649; France 4,358; West Germany 4,201.
Dolomite	21,108	25,340	West Germany 12,530; France 10,379; Netherlands 798.
Gravel and crushed rock thousand tons	5,175	5,347	Netherlands 3,176; West Germany 671; United Kingdom 418.

See footnotes at end of table.

Table 3.—Belgium-Luxembourg: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
NONMETALS—Continued			
Stone, sand and gravel—Continued			
Limestone except dimension	168,060	203,135	France 107,969; United Kingdom 81,805; West Germany 10,636.
Quartz and quartzite	50,954	70,104	West Germany 58,212; Norway 2,819; Netherlands 1,384.
Sand excluding metal bearing thousand tons	8,993	8,450	Netherlands 7,726; West Germany 22; France 6.
Sulfur:			
Elemental, all forms	303,798	333,809	United States 234,287; West Germany 571.
Sulfur dioxide	8,549	4,242	West Germany 3,988.
Sulfuric acid	156,762	218,544	Netherlands 89,411; West Germany 74,412; Poland 37,063.
Talc, steatite, soapstone, and pyrophyllite	32,912	39,751	United States 22,162; Norway 5,291; France 4,133.
Other nonmetals n.e.s.:			
Crude including meerschaum, amber, jet	[r] 87,177	100,945	Netherlands 36,822; West Germany 20,820; U.S.S.R. 19,820.
Slag, dross, and similar waste not metal bearing	216,683	256,800	Netherlands 84,955, France 53,199; West Germany 48,225.
Oxides and hydroxides of magnesium, strontium, and barium	2,481	2,990	Netherlands 1,475; France 495; United States 469.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	8,549	6,017	Netherlands 3,762; United States 705; Trinidad and Tobago 419.
Carbon black and gas carbon	23,647	25,303	West Germany 9,425; Netherlands 7,068; France 5,261.
Coal and briquets:			
Anthracite and bituminous thousand tons	6,667	7,706	West Germany 3,571; United States 2,025; Netherlands 795.
Briquets of anthracite and bituminous coal do	317	282	Netherlands 250.
Lignite and briquets do	120	100	West Germany 99.
Coke and semicoke do	5,239	5,211	West Germany 4,510.
Hydrogen, helium and rare gases	2,143	2,634	West Germany 1,864; Netherlands 392; United States 202.
Peat including peat briquets and litter	60,634	60,401	Netherlands 42,993; West Germany 16,658.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	210,559	222,157	Libya 51,527; Kuwait 37,434; Saudi Arabia 34,561.
Refinery products:			
Gasoline do	[r] 5,569	7,911	Netherlands 2,693; Italy 1,534; U.S.S.R. 1,162.
Kerosine do	[r] 563	1,435	Italy 495; U.S.S.R. 347; Netherlands 342.
Distillate fuel oil do	[r] 12,548	12,674	Netherlands 7,046; East Germany 1,025; West Germany 875.
Residual fuel oil thousand 42-gallon barrels	[r] 19,367	17,776	Netherlands 9,158; West Germany 3,940; France 1,396.
Lubricants do	[r] 2,243	2,692	Netherlands 728; United States 538; United Kingdom 432.
Mineral jelly and wax do	[r] 90	94	West Germany 43; France 20; Netherlands 13.
Other:			
Liquefied petroleum gas do	30,949	43,952	Netherlands 42,804; West Germany 939; France 136.
Nonlubricating oils n.e.s do	2,091	2,512	Netherlands 721; United States 428; United Kingdom 413.
Pitch, pitch coke and petroleum coke do	836	962	United States 888; Czechoslovakia 11.
Bitumen and other residues do	321	274	France 223.
Bituminous mixtures n.e.s do	163	217	Netherlands 125; West Germany 45; France 25.
Mineral tar and other coal, petroleum- or gas-derived crude chemicals	105,111	125,064	Netherlands 83,351; France 28,571; West Germany 9,404.

[r] Revised. NA Not available.

COMMODITY REVIEW

Metals. — *Aluminum.* — Belgium relied solely on imports for its supply of primary aluminum during 1971. France was the major exporter of aluminum to Belgium with the firm of Péchiney supplying the bulk of the metal. Domestic production is limited to aluminum obtained from secondary metal sources and was approximately 2.5 million tons.

Iron and Steel.—Output of the Belgian steel industry decreased slightly in 1971 from that of the previous year. Strikes during the last 2 months were the main reason for the decline. Belgium continued to be a major exporter with the domestic market consuming only 23 percent of capacity. Belgian producers continued to depend on the European market for the outlet of their iron and steel products.

A major development in production technology in 1971 was an extensive modernization program in addition to the continuing trend from Bessemer to oxygen steel in the manufacturing process. Another change in the industry in 1971 was the merger of several major domestic producers and also the merger of domestic producers with foreign corporations.

Production at the ferrous metals firm of S. A. Cockerill-Ourgrée-Providence et Esperance-Longdoz was curtailed by a strike. One-third of the 33,000 workers which produce approximately 30 percent of the Belgian steel production were effected by the work stoppage.

Zinc.—The Société de Prayon, S.A., one of Belgium's leading nonferrous producers, is building a new zinc electrolysis plant at Eheim, near Liège. It is planned for operation in mid-summer 1972 with an initial capacity of 50,000 tons of metallic zinc annually.

A new electrolytic zinc plant is planned at Overpelt in northern Belgium. Planned capacity is 80,000 tons per year with the plant coming on stream in 1974 at a cost of $31.8 million. This new facility will replace two old horizontal zinc smelters now in operation at Overpelt and Lommel.

Nonmetals.—During 1971 cement production showed a slight increase over 1970 with production totaling 6,931,000 metric tons. Other minor nonmetal increases were reported for gypsum, lime, and sand and gravel. The abrasives showed a drop in production and the other nonmetals remained approximately the same as in 1970.

Charles Taylor Sons, S.A., a subsidiary of NL Industries, Inc., began construction of a brick plant which is expected to be in operation in 1972.

Mineral Fuels.—Liquid fuels and natural gas continued to be the major sources of energy in Belgium during 1971 as production of domestic coal continued to decline.

Coal.—Carbonization in coke ovens is the only purpose for which coal is used in Belgian industry. The country had 12 metallurgical and three independent coking plants in operation during the year.

LUXEMBOURG

The steel industry of Luxembourg reported a decline in production in 1971 that continued the pattern established in 1969. Steel production is the backbone of the country's economy and the drop in volume reflects the impact of lower prices, increased raw material, and labor costs. Luxembourg remained 16th among world producers and accounted for 1 percent of the world production. Its 16 tons of steel per capita is the highest in the world and compares with 0.6 ton per capita for the United States. The industry is concentrated in the southern part of the country near Lorraine. Aciéries Réunies de Burbach-Eich-Dudelange S.A. (ARBED) accounts for 90 percent of the production.

COMMODITY REVIEW

Nonmetals.—Production of nonmetals in 1971 was approximately the same; cement, fertilizers, gypsum, sand, and stone showed increases.

Table 4.—Luxembourg: Production of mineral commodities

(Thousand metric tons unless otherwise specified)

Commodity	1969	1970	1971 [p]
METALS			
Iron ore and concentrate	6,311	5,722	4,507
Pig iron (including blast furnace ferroalloys)	4,872	4,814	4,588
Steel:			
Crude	5,521	5,462	5,241
Semimanufactures	[r] 4,332	4,278	4,092
NONMETALS			
Cement, hydraulic	207	245	262
Clays, refractory metric tons	1,638	NA	NA
Fertilizers manufactured, phosphatic:			
Thomas slag, gross weight	964	795	841
Other, phosphorus pentoxide content	120	NA	NA
Gypsum and anhydrite, crude metric tons	9,189	5,062	5,351
Quartz, quartzite and glass sand cubic meters	18,100	15,400	(1)
Stone, sand and gravel n.e.s.:			
Sand:			
Molding	18	17	15
Other, industrial	712	614	742
Stone:			
Building stone:			
Rough cut thousand cubic meters	19	8	7
Facing thousand square meters	50	42	53
Cut stone, crude cubic meters	379	539	198
Crushed rock	(2)	[3] 248	609
Gravel	173	NA	NA
Dolomite n.e.s	284	325	200
Limestone n.e.s	25	14	NA
Paving blocks thousand pieces	37	36	27
Slate slabs thousand square meters	22	14	13
MINERAL FUELS AND RELATED MATERIALS			
Coke, gas plant	10	--	--
Manufactured gas million cubic feet	[r] 56	36	NA

[p] Preliminary. [r] Revised. NA Not available.

[1] Volume not available; output reported as 8,625 metric tons.

[2] Tonnage not available; output reported as 476,520 cubic meters.

[3] Erroneously reported in previous edition as cubic meters.

The Mineral Industry of Bolivia

By V. Anthony Cammarota, Jr.[1]

The mineral industry of Bolivia contributed 10 percent to the gross domestic product (GDP) in 1971, down from 11 percent in 1970. The mineral industry, however, accounted for 80.4 percent of the total value of Bolivia's exports.

In midyear the Government of President Juan Torres was overthrown and Colonel Hugo Banzer Suarez was declared President. The new Government stated that while the nationalization of Bolivian Gulf Oil Co. (BOGOC), Mina Matilde Corp., and International Metal Processing Corp. (IMPC) was irrevocable, Bolivia would honor its international commitments on foreign investments.

In December, an investment law was approved and scheduled to go into effect shortly thereafter. The law covers mining, among other sectors of the economy, but excludes petroleum and gas. One of the principal purposes of the law is to attract foreign capital for the installation of industrial complexes that can compete internationally. The legislation appears applicable equally to foreign and domestic investment. Strategic industries, for example, metallurgy, steel, and petrochemicals, can be joint ventures with foreign majority interest, but must revert to majority Bolivian ownership within 25 years.

A list of the more important Supreme Resolutions (S.R.), Supreme Decrees (S.D.) and Decree Laws (D.L.) passed in 1971 affecting the mining and smelting industries follows:

S.D. Number 09633, March 26, 1971: Establishes that all Corporación Minera de Bolivia (COMIBOL) labor starting Jan. 1, 1971 will receive those wages in force on May 1965. Contract prices in all mines also are raised 23 percent, except at Catavi. These measures increased the cost of producing tin by approximately $0.05 per pound.

S.D. Number 09643, March 31, 1971: Authorizes Ministers of Finance, Mining, and the Manager of Empresa Nacional de Fundiciones (ENAF) to sign contract with Skoda Export of Czechoslovakia for machinery to build the antimony smelter in Vinto, Oruro.

D.L. Number 09699, April 30, 1971: Abolishes D.L. Nos. 07721 and 07722 of July 25, 1966 thereby expropriating Matilde Mine Corporation's plant and reverting the mine to COMIBOL.

S.D. Number 09890, September 7, 1971: Creates Commission to draft a new Mining Code. Members will be representatives of Ministry of Mining and Metallurgy, COMIBOL, ENAF, Association of Medium Miners, Small Miners, and the National Federation of Cooperatives.

S.D. Number 09900, September 15, 1971: Creates Commission to study and plan within 90 days an operation for the mining and smelting of iron.

S.R. Number 158582, September 15, 1971: Approves contract between COMIBOL and the Soviet firm Vsesojusnoe Objedimenic Machinoexport for the construction of four tin volatilization plants. The Soviet firm will supply all equipment and technical direction during installation and will conduct startup operations of the plants.

D.L. Number 10056, December 27, 1971: Fixes the amount of indemnification, $1,447,066, to IMPC for the expropriation on January 11, 1971 of IMPC's tin concentrating plant at Catavi. This decree law also authorizes IMPC and COMIBOL to form a joint venture company to treat tin tailings at Kenko, Catavi, and Unificada de Potosi.

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[1] Physical scientist, Division of Nonferrous Metals.

PRODUCTION

Production of about half the metals and nonmetals showed little change from 1970 levels. Substantial increases were noted for iron ore, 42 percent, and crude gypsum, 300 percent. Tin production decreased 1 percent; silver, 16 percent; gold, 28 percent, and sulfur, 42 percent. Natural gas production increased substantially from 29 billion cubic feet to 82.5 billion cubic feet; crude oil production rebounded to 13,446,000 barrels, about the same level of 2 years ago.

Table 1.—Bolivia: Approximate production of mineral commodities

(Metric tons unless otherwise specified)

Commodity[1]	1969	1970	1971 [p]
METALS [2]			
Aluminum, bauxite and concentrates	--	19	--
Antimony:			
Mine output, metal content	13,137	11,766	[3] 11,667
Metal[4]	28	33	--
Bismuth:			
Mine output, metal content	607	608	[3] 667
Metal	3	8	--
Cadmium, mine output, metal content[5]	35	69	87
Copper:			
Mine output, metal content	7,983	8,759	[3] 8,228
Metal	13	--	--
Gold, mine output, metal content[6] ... troy ounces	49,854	30,603	22,179
Iron ore	1,765	4,217	5,970
Lead:			
Mine output, metal content	24,703	25,397	[3] 23,125
Metal including alloys	22	8	[3] 18
Manganese ore, gross weight	--	84	764
Mercury[4] ... 76-pound flasks	68	12	--
Silver, mine output, metal content ... thousand troy ounces	6,013	6,816	[3] 5,723
Tin:			
Mine output, metal content ... long tons	29,415	28,787	[7] 28,605
Metal including alloys ... do	47	301	[8] 7,116
Tungsten, mine output, metal content	1,841	1,845	[3] 2,006
Zinc, mine output, metal content	26,195	46,483	[3] 45,792
NONMETALS			
Cement, hydraulic ... thousand tons	80	115	128
Gypsum, crude	[4] 3,613	[4] 500	[9] 2,000
Mica	--	6	--
Sulfur, elemental	[4] 36,219	[4] 16,313	[3] 9,492
MINERAL FUELS AND RELATED MATERIALS			
Gas, natural:			
Gross production ... million cubic feet	28,409	29,000	82,451
Marketable production[e] ... do	[r] 3,920	[r] 4,000	1,427
Natural gas liquids:			
Natural gasoline ... thousand 42-gallon barrels	NA	95	46
Liquefied petroleum gas ... do	NA	32	48
Petroleum:			
Crude oil ... do	14,759	8,820	13,446
Refinery products:			
Gasoline ... do	1,846	1,869	2,174
Jet fuel ... do	66	99	115
Kerosine ... do	742	799	845
Distillate fuel oil ... do	612	642	1,625
Residual fuel oil ... do	958	941	
Lubricants ... do	51	47	45
Liquefied petroleum gas ... do	27	36	50
Other ... do	3	4	4
Refinery fuel and losses ... do	128	128	97
Total ... do	4,433	4,565	4,955

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, salt and a variety of crude nonmetallic construction materials such as clays, stone, and sand and gravel are produced, but information is inadequate to make reliable estimates of output levels.

[2] Unless otherwise specified, data shown represent the sum of production by COMIBOL and exports by medium and small mines.

[3] Total national exports.

[4] Exports by medium and small mines only.

[5] Contained in zinc concentrates produced by COMIBOL for export.

[6] Sum of placer production, COMIBOL production (in ores and concentrates of other metals) and medium and small mines' exports (in ores and concentrates of other metals).

[7] COMIBOL production plus COMIBOL purchases from other producers plus exports by medium and small mines.

[8] Tin content of production from Metabol and Pero smelters plus exports by ENAF smelter.

[9] Net exports.

TRADE

Preliminary figures indicated an export value of $139 million[2] f.o.b. for minerals and $24 million for petroleum. This is a decrease from 1970 figures of $33 million for the former but an increase of $14 million for the latter. Exports of petroleum to Peru and Chile accounted for almost all of the increase.

The value of all exported mineral commodities except zinc decreased, mainly because of price declines. Increased quantities of tin, tungsten, bismuth, and antimony were exported, but prices were lower. Tin accounted for 61 percent of the total mineral export value in 1971, compared with 51 percent in 1970. The tin portion of the total export market increased to 47 percent from 44 percent in 1970.

The relation of mineral trade to total trade for 1969–71 is tabulated below:

	Value (million dollars)	
	Mineral commodity trade	Total commodity trade
Exports (f.o.b.):		
1969	[r] 140	[r] 174
1970	[r] 172	[r] 197
1971	139	180
Imports (c.i.f.):		
1969	NA	[p] 165
1970	NA	[e] 159
1971	NA	[p] 166

[e] Estimate. [p] Preliminary. [r] Revised.
NA Not available.

Table 2.—Bolivia: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1969
METALS			
Antimony:			
In ore and concentrate	13,149	11,576	Mainly to United States.
Metal, including alloys, all forms	28	NA	
Bismuth, in ore and concentrate	669	623	Peru 517; United States 149.
Copper, in ore and concentrate	8,012	8,853	Japan 4,250; United States 2,099.
Gold troy ounces	44,072	4,990	Mainly to United States.
Lead in ore, concentrate, and metal including alloys, all forms	25,252	25,756	United States 18,880; Japan 2,314.
Mercury 76-pound flasks	67	1	Mainly to United States.
Silver, in ore and concentrate thousand troy ounces	6,035	5,967	United States 3,713; United Kingdom 1,000.
Tin, in ore and concentrate and as metal long tons	29,775	27,398	Mainly to United Kingdom.
Tungsten, in ore and concentrate	1,841	1,912	Mainly to United States.
Zinc, in ore and concentrate	26,521	46,538	Japan 18,291; United States 7,972.
NONMETALS			
Gypsum	4,613	500	All to Brazil.
Sulfur, elemental	36,219	16,313	Mainly to Chile.
MINERAL FUELS AND RELATED MATERIALS			
Petroleum, crude thousand 42-gallon barrels	10,068	4,662	United States 6,846; Argentina 3,222.

NA Not available.

COMMODITY REVIEW

METALS

Antimony.—There are an estimated 2,400 miners employed in the medium-mine sector of the antimony industry in Bolivia, as well as about 300 small-miner groups composed of about 900 partly seasonal miners. With the exception of Empresa Minera Unificada, S.A. (EMUSA), and a few other relatively large producers, most of the mines are worked by rudimentary methods. The grade of the ore mined is estimated to be between 5 and 10 percent metal. Only a few mines recover fines by flotation. As a result, a significant quantity of low-grade ore is discarded into dumps where much of it subsequently oxidizes and becomes very expensive and difficult to recover.

About 78 percent of the antimony exports came from mines in the Departments of Potosí and Chuquisaca; the remaining 22 percent came from mines in the De-

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[2] Where necessary, values have been converted from Bolivian dollars (B$) to U.S. dollars at the rate of B$11.885=US$1.00.

Table 3.—Bolivia: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1968
METALS	
Aluminum:	
Oxide and hydroxide ... kilograms	348
Metal and alloys, all forms	484
Arsenic oxide and acids	1
Chromium oxide and hydroxide	8
Copper metal and alloys, all forms	293
Iron and steel:	
Pig iron, sponge iron, iron and steel granules, powder and scrap	1
Ferroalloys	635
Steel, primary forms	42
Steel semimanufactures, common steel:	
Bars, rods, angles, shapes, sections	9,653
Plates and sheets	11,390
Hoop and strip	103
Railroad track and accessories	1,400
Wire	3,016
Pipes, tubes and fittings	17,332
Castings and forgings	64
Steel semimanufactures, high carbon and alloy steel	1,981
Lead:	
Oxides	19
Metal, all forms	8
Magnesium metal, all forms	7
Manganese oxide ... kilograms	12
Mercury ... 76-pound flasks	10
Molybdenum metal, all forms ... kilograms	179
Nickel metal, all forms	2
Platinum-group metals, all forms ... troy ounces	322
Silver metal, all forms ... kilograms	386
Tungsten metal, all forms ... do	202
Titanium oxide	100
Zinc metal, all forms	4
Other:	
Ashes, slags and residues of metallurgical operations:	
Base metals	2
Precious metals ... kilograms	37
Alkali and alkali earth metals ... do	1,018
NONMETALS	
Abrasives, natural	7
Asbestos ... kilograms	115
Barite	606
Boric acid and oxides ... kilograms	88
Cement, hydraulic, including clinker	46,017
Clays:	
Bentonite	6,137
Decolorizing earths	15
Fire clay	25
Kaolin	41
Other	25
Diatomite	63
Diamond, industrial ... carats	10,000
Fertilizers, manufactured:	
Nitrogenous	1,879
Phosphatic	2,271
Potassic	70
Mixed	1,354
Graphite	8
Lime	88
Magnesite	60
Mica ... kilograms	356
Pigments, mineral	47
Precious and semiprecious stones ... kilograms	88
Salt	113
Sand	213
Sodium and potassium compounds, n.e.s., sodium and potassium oxides, and hydroxides	1,024
Stone:	
Dimension	10
Other ... kilograms	48
Sulfur:	
Elemental	45
Sulfuric acid	115
Talc, soapstone and pyrophyllite	22

Table 3.—Bolivia: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity		1968
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural		1,431
Carbon black		72
Coal, all grades		963
Coke, all types		231
Gases, helium, and other inert		9
Petroleum:		
Crude oil	thousand 42-gallon barrels	(1)
Refinery products:		
Gasoline	do	132
Lubricants	do	6
Other	do	31
Total	do	169

(1) Less than ½ unit.

partments of Oruro, Cochabamba, and La Paz.

An agreement was made in April for an antimony smelter to be constructed in Bolivia by the Czechoslovakian firm, Skodaexport. The smelter will have an annual production capacity of 5,000 metric tons of metallic antimony and 1,000 tons of antimony alloys. It will be located at Vinto, near the tin smelter. Full operations are scheduled to begin in late 1974 or early 1975.

Gold.—South American Placers, Inc. (SAPI), continued to mine gold near the town of Teoponte. In addition to SAPI, there are approximately 23 gold mining cooperatives along the Tipuani River, down from about 60 cooperatives 5 years ago. The decline is the result of working out the placer deposits in the concessions along the river and the 10 percent surcharge imposed by the Banco Minero on gold purchases. Gaensel Gold Mines and Co. has completed a 45-meter shaft to bedrock along the banks of the upper Tipuani River. The company entered into an arrangement with Lipez Mining Co. to explore and work about 15 kilometers of the placer area along the river near the village of Mojotoro.

Iron Ore.—An agreement to implement a plan to investigate the iron deposits of Mutún Mountain was signed in November by Bolivia's Minister of Foreign Relations, COMIBOL, and the United Nations. The project, scheduled to take about a year and a half and to be completed in 1973, will be administered jointly by the Bolivian Government and the United Nations.

About 8,200 feet of core holes will be drilled and the escarpments of Mutún Mountain will be investigated geologically for both iron and manganese. There have been reports of small manganese lenses occurring in the periphery of the deposit.

In 1970, COMIBOL held an official ceremony dedicating a crushing and washing plant at Mutún, although operations did not begin until April 1971. The plant has a screening and washing capacity of about 400 tons per day. The plant was established to process 50,000 to 60,000 tons of ore to a grade of at least 60 percent iron and to determine the transportation cost of Mutún ore to smelters in San Nicolas, Argentina, and its amenability to the smelting techniques used there.

Arthur D. Little, Inc., which had a contract for a feasibility study of the Mutún project, reported that the deposit is the country's only iron resource of significant economic importance.

Tin.—The three groups of mining enterprises (small, medium, and COMIBOL) produced 28,605 long tons of tin-in-concentrate in 1971. Bolivia maintained its position as the world's second largest tin producer. The cost to COMIBOL to mine and market tin continued to increase in the first half of 1971 to $1.55 per pound compared with $1.46 for the same period in 1970. Its total labor force on June 30, 1970, numbered 21,709, but on the same date in 1971, it had grown to 22,999, an increase of 1,290. Only four mines made a profit in the first half of the year: Huanuni, the Quechisla Group, and two very small mines, the recently acquired Bolivar mine which had been under private lease and the Kami tungsten-tin cooperative. Catavi, which accounts for about 34 percent of COMIBOL's tin production, broke about even during the first half. Catavi, Huanuni, and the Quechisla Group produced about 61 percent of COMIBOL's output.

Empresa Nacional de Fundiciones reported that at the end of the first year's operation of the tin smelter at Vinto, all its financial obligations to its suppliers of tin concentrates and to the Central Bank had been paid. The Central Bank acted in many cases as ENAF's source of financing. The smelter employs 400 persons. The Government has invested $15 million in the smelter including provisions to facilitate expansion.

The contract for the smelter, which was constructed by Klöckner-Humboldt-Deutz of West Germany, called for a production capacity of 19,700 tons per year of electrolytic tin of 99.95 percent metal content. However, this rate of output will not be attained until completion of the second and third stages of the project. The smelter, which currently has a capacity of 7,400 tons of tin and 800 tons of tin alloy, produced 6,815 tons of refined metal during 1971.

Bolivia hopes to place at least 30 percent of the current capacity of the Vinto smelter in the Subregional Andean Pact market. It is thought that Chile, Colombia, Ecuador, and Peru can collectively absorb about 2,000 tons per year, affording a favorable market for Bolivia's tin on grounds of geographical proximity and the 25-percent-lower import duties accorded to Andean Pact countries.

Bolivia is planning to build four volatilization plants to recover tin from low-grade mill tailings. In September the Subsecretary of Metallurgy in the Ministry of Mining and Metallurgy said that the use of German technology in the plants, which had been under consideration, had to be discarded in favor of Soviet technology because the latter would result in a higher recovery rate. Under the plan, four volatilization plants will be built, one each at the Catavi, Huanuni, and Colquiri mines, and the fourth at the town of Oruro. The Catavi unit, to cost $1.5 million, is scheduled to start operating by the end of 1973. Each of the plants will be able to treat 150,000 tons per year of tailings containing from 0.07 to 3 percent fine tin. It is estimated that the concentrate will have a grade of 50 percent. Final processing will likely be done at the Vinto smelter. Engineers from the U.S.S.R. were in Bolivia at yearend planning the construction of the new facilities.

In January, IMPC, a subsidiary of Harvest Queen Mills of Dallas, Tex., lost its operation for treating tailings from the Catavi mine through nationalization. Under terms of an agreement worked out in December to compensate the company for loss of its mill and dredge operation, COMIBOL paid IMPC $1,447,066. The firm will renew operations as a mixed company, with COMIBOL controlling 55 percent. IMPC agreed to share its technol-

Table 4.—Bolivia: Exports of tin by grade, group, and company, 1971

(Kilos of contained tin)

Grade	COMIBOL	Medium mines	BAMIN[1] (small)	Other	Total
0–10	243,266	16,404	2,517	4,940	267,127
10–15	3,031	--	17,482	7,300	27,813
15–20	1,255,594	564,079	897,976	35,570	2,753,219
20–25	1,175,380	1,348,930	314,817	--	2,839,127
25–30	665,279	861,524	13,064	--	1,539,867
30–35	602,386	106,819	8,698	--	717,903
35–40	1,565,940	453,883	269,554	--	2,289,377
40–45	1,921,794	474,909	597,328	--	2,994,031
45–50	3,187,908	432,325	938,739	--	4,558,972
50–55	3,097,684	346,370	582,752	--	4,026,806
55–60	979,186	22,390	49,216	--	1,050,792
60–65	25,329	206,345	--	--	231,674
65–70	--	155,631	--	--	155,631
70–80	--	9,846	--	3,035	12,881
Over 99	--	--	--	6,811,356	6,811,356
Total	14,722,777	4,999,455	3,692,143	6,862,201	30,276,576

[1] Banco Minero de Bolivia (BAMIN).

Source: Ministerio de Mineria y Metalurgia.

Table 5.—Bolivia: Exports of tin, by group
(Long tons of contained tin)

Group	1969	1970	1971p
Tin in concentrates:			
Corporación Minera de Bolivia (COMIBOL)	18,575	16,653	14,468
Medium-size mines	6,687	6,480	5,003
Banco Minero	4,219	3,728	3,623
Smelter products:			
Refined metal and solder	27	301	6,843
Volatilization products	267	236	273
Total	29,775	27,398	30,210

p Preliminary.

ogy and assist in obtaining financing for expected expansion of the operation. At the end of 10 years, all installations will pass to COMIBOL.

Zinc.—On April 30, COMIBOL took over the operation of the Matilde zinc and lead mine. It was planned that the 100,000-metric-ton-per-year output of zinc concentrate would be sold to the Japanese company Kanematsu Gosho, but the company was unable to proceed with mineral concentrate purchases. It was reported that Intermill Products Corp., a U.S. company with ties to Philipp Brothers Corp., one of the partners in the Matilde Mine Corp., agreed to buy Matilde's total annual production of about 80,000 tons of zinc concentrate.

Instead of seeking direct contracts for the construction of its planned zinc smelter, Bolivia had decided to call for bids from international firms in early 1972. The call was to be made on the basis of three reports: (1) a U.S.S.R. study that is currently underway, (2) a study by the Yugoslav company Rudis, and (3) a study made by Mina Matilde.

A zinc smelter will constitute a significant advance for Bolivian metallurgy because the sulfuric acid byproduct will be used to leach copper ores, of which there are large reserves in various parts of the country.

MINERAL FUELS

Petroleum and Natural Gas.—Crude petroleum production increased to 13,446,449 barrels in 1971 or 52 percent over 1970's production of 8,820,259 barrels. Petroleum exports also increased from 4,662,004 barrels in 1970 to 8,447,217 barrels in 1971. These increases were the result of short-term sales contracts made by Yacimientos Petrolíferos Fiscales Bolivianos (YPFB) with Peru and Chile and increased exports to Argentina.

Petroleum exports to Argentina, Peru, and Chile, and those purchased by Gulf Oil Co., amounted in barrels, to 3,902,366, 2,914,835, 831,727, and 798,289, respectively.

By the end of 1971, YPFB, through the Santa Cruz, Bolivia-Arica, Chile, oil pipeline, was exporting 15,000 barrels per day, of which 5,000 barrels went to Chile and 10,000 barrels went to Peru; Argentina increased its petroleum purchases to approximately 15,000 barrels per day through the 6-inch pipeline extending from Santa Cruz-Camiri, Bolivia, to the border town of Pocitos, Argentina. The last negotiated price for oil by YPFB in 1971 with the national petroleum companies of both Peru and Chile was $2.75 per barrel, but was subject to change in 1972 with the agreement of both seller and buyer. The price of oil exported to Argentina remained at about $3.05 per barrel.

On September 23, 1971, negotiations were completed with the International Bank for Reconstruction and Development (IBRD) and the Inter-American Development Bank (IDB) for a loan to finish the 24-inch gas pipeline from Santa Cruz to Pocitos, Argentina. Contracts were signed with IBRD for a loan of $23.25 million payable in 20 years at 6.5 percent annual interest, and with the IDB for a loan of $19.0 million payable in 20 years at 8.0 percent annual interest. Bolivia also assumed the BOGOC debt of $14.0 million to the New York State Common Retirement Fund, which was used for starting construction of the pipeline, bringing its total cost to $56.25 million. The gas pipeline construction was reinitiated in July 1971 by Williams Brothers Overseas Company Ltd. The pipeline was scheduled to be finished by the end of April 1972, and gas sales to Argentina were to begin either in April or May 1972. Gas sales to Argentina for the first 7 years are expected to reach an average of 141 million cubic feet per day, after which the gas exports will be increased to 159 million cubic feet per day for the remaining 13 years.

YPFB's drilling operations declined in 1971 to four completed exploration wells, compared with 10 completed in 1970. Development wells drilled in 1971 numbered 14, compared with 23 drilled in 1970. Total footage drilled in 1971 was 173,423 feet—54,234 feet in exploration and 119,423 feet in development—compared with 174,862 feet in 1970. YPFB finished developing the La Peña field by drilling 11 wells in 1971. Exploration drilling on the Altiplano close to Vilque was postponed until 1972. Drilling was to have begun on a stratigraphic well in August 1972 about 6,600 feet deep on a large structure reportedly discovered by seismographic work.

On October 6, 1971, the Minister of Energy and Hydrocarbons stated that a draft was being prepared of a new Petroleum Code that would permit private risk capital to participate in the exploration and development of hydrocarbon fields and in the production of hydrocarbons. Petroleum and natural gas concessions would no longer be issued, but YPFB would be allowed to enter into contracts with private companies for the exploration, development, and production of hydrocarbons.

Gulf Oil Co. is receiving compensation from all petroleum-condensate exports from ex-Gulf fields by YPFB and will receive a greater amount per year when YPFB begins its natural gas sales to Argentina. In 1970 Gulf received for expropriation indemnification $1,048,470 or 35 percent of the value of the sales by YPFB of 1,331,391 barrels of petroleum. In 1971 Gulf received from Bolivia's petroleum sales, indemnification amounting to $2,196,124 and also received from YPFB, at the rate of $0.38 per barrel exported, $1,525,082 to cover part of the debt owed by YPFB to Gulf.

The Director of the Dirección General de Petróleo (DGP) stated that YPFB's recoverable reserves of petroleum-condensate and gas were 200 million barrels and 2.1 trillion cubic feet, respectively, on December 31, 1971. The La Peña field, now fully developed, is estimated to contain 30 million recoverable barrels of petroleum.

According to Gulf's estimate of January 1, 1969, the Caranda, Rio Grande, and Colpa fields, after subtracting production through December 31, 1971, would contain a proven reserve of 143 million barrels. The development of La Peña field in 1971 increased these reserves by an additional 30 million barrels, to 173 million barrels. The 27-million-barrel difference is attributed to recoverable reserves claimed by YPFB in its original fields.

Proven natural gas reserves on December 31, 1971, in the Caranda, Colpa, and Rio Grande fields totaled 2.1 trillion cubic feet, which is comparable with the 2.3 trillion cubic feet estimated by Gulf in October 1969. YPFB estimates that the indicated reserves for the Yapacani, Almendro, La Peña, Palmar, and Santa Cruz fields are 1.5 trillion cubic feet.

In November 1971, YPFB finished enlarging the refinery at Cochabamba from a treatment capacity of 8,000 barrels to 13,000 barrels of petroleum per day. Full capacity of 15,000 barrels of petroleum input is expected in 1973. The policy of YPFB is to have two relatively large refining centers in Bolivia, one in Cochabamba and the other in Santa Cruz.

Total petroleum processed in Bolivia's refineries in 1971 averaged about 13,600 barrels per day for a total of 4,954,510 barrels in 1971.

Petrochemicals.—The Andean Pact countries have not yet clearly defined Bolivia's roll in the manufacture of insecticides, pesticides, and plastics. YPFB reportedly will

Table 6.—Bolivia: Crude Petroleum by company and field

(Thousand 42-gallon barrels)

Company and field	1970	1971[p]
Yacimientos Petrolíferos Fiscales Bolivianos:		
Camiri	1,076	958
Tatarenda	381	729
Monteagudo	1,682	3,046
El Toro	96	74
Bermejo	123	99
Camatindi	36	30
El Tigre	6	13
San Alberto	1	--
Total	3,401	4,949
Ex-Bolivian Gulf Oil Co.:		
Caranda-Colpa-Rio Grande, La Peña	5,419	8,498
Grand total	8,820	[1] 13,446

[p] Preliminary.

[1] Data may not add to total shown because of independent rounding.

Table 7.—Bolivia: Consumption[1] of petroleum refinery products

(Thousand 42-gallon barrels)

Product	1970	1971
Gasoline, aviation[2]	98	109
Gasoline, motor	1,748	1,797
Kerosine	771	825
Diesel oil	603	663
Fuel oil	651	714
Lubricants	50	51
LPG	35	94

[1] Figures refer to actual civilian and military consumption through sales to consumer, and including YPFB consumption.

[2] Imports.

be allowed to have a monopoly in the manufacture and marketing within the Pact of certain types of insecticides and pesticides, but YPFB is not sure that the countries will agree to give Bolivia a monopoly in the manufacture and sales of certain types of plastics YPFB could produce.

The project to construct a combined explosive and fertilizer plant in Santa Cruz depends largely on marketing the fertilizer in neighboring countries. No foreign marketing arrangements for fertilizers have been reached that would enable YPFB to construct the plant. Two mixed commissions of Bolivian and Brazilian personnel were created to study the utilization of natural gas for industrial projects in both countries and to supply liquid petroleum gas and refined products to Brazil's Mato Grosso area.

Some of the important Supreme Decrees (S.D.) and Decree Laws (D.L.) passed in 1971 affecting Bolivia's petroleum and gas industry are as follows:

S.D. Number 09566, February 8, 1971—Ratifies the contract between Bolivia and BOGOC signed on September 11, 1970, fixing the amount of indemnification to Gulf (on debts not included in the indemnification for expropriation).

S.D. Number 09601, February 24, 1971—Approves and ratifies consolidated debt of YPFB to Gulf of $9,708,439. Also approves and ratifies debt to Gulf of $1,364,612 for advance tax payments and guarantee deposits. A total of $11,073,051 will be paid by the sale of oil from the Caranda, Colpa, and Rio Grande fields. This total sum is not included in the $78 million that Bolivia owes Gulf for the expropriation of its properties.

S.D. Number 09665, April 19, 1971—Authorizes YPFB to sign contracts with Williams Brothers and Ferrostahl A.G. regarding the reinitiation of work on the gas pipeline from Santa Cruz to Argentina.

D.L. Number 09667, April 19, 1971—Levies tax of 11 percent of total construction costs in petroleum industry for all future construction work by national or foreign companies.

The Mineral Industry of Brazil

By Frank E. Noe[1]

The Brazilian mineral industry in 1971 marked the sixth consecutive year of continued upward trend by appreciable increases in production, development, and prospection for mineral raw materials. The Amazon Basin, virtually untouched, is now moving into focus as one of the most promising undeveloped mineral provinces in the world. Among those engaged in exploration with a broad countrywide objective is the Cia. Vale do Rio Doce (CVRD) and the State Minerals Resources Exploration Co., Cia. de Pesquisa de Recursos Minerais (CPRM). Overseas participation in exploration is represented by many mining companies from the United States, Canada, Australia, West Germany, France, England, Switzerland, Japan, and elsewhere.

The increased attention allotted to Brazil in general and the Amazon in particular is due to a combination of a number of factors. Political instability and intense nationalism in Peru, Chile, and Bolivia have retarded foreign interest in new mining ventures in those countries. Brazil has capitalized on this situation by offering tax and investment incentives and by opening up prime territory to private development. Government support of exploration in the form of mapping projects, geological studies, and aid from CPRM, has also aided in the development of a mining boom.

In September, the Brazilian Government published its first National Plan for Economic and Social Development for 1972–74, a document which outlines concisely the Government's development strategy and goals over the next 3 years. Two of the principal goals are to sustain an economic growth rate of between 8 and 10 percent and to reduce the rate of inflation to around 10 percent by 1974. In the investment program to be undertaken over the period covered by the plan, high priority is given to education, agriculture, housing, and health and sanitation, all areas of high social impact. In the area of industrial development, public and private expenditures are expected to reach $5.1 billion, including $1.2 billion for steel and $900 million for chemicals and petrochemicals. In addition, investments of the public and private sectors in the minerals industries are projected at $550 million, with Federal expenditures for research on mineral resources to be an additional $72 million exclusive of prospecting for petroleum but with $25 million for uranium prospecting.

Among the goals to be reached by 1974 are the following installed capacities: steel, 11.2 million tons; aluminum, 120,000 tons; zinc, 30,000 tons; tin, 15,000 tons; and cement, 17.5 million tons. Production of iron ore is to be increased to 76 million tons with iron ore exports to reach 65 million tons. Production of manganese ore is projected to 2.3 million tons with exports of 2.1 million tons. Production of fertilizers is to increase from 212,000 tons in 1970 to 820,000 tons by 1974. A 50-percent increase in petroleum refining capacity, to 283 million barrels, has also been projected.

These goals indicate orders of magnitude. For the public sector they are, in general, minimum values to be reached; for the private sector they have been considered merely indicative of the outlook for growth of the sector in the light of approved incentives.

The Brazilian economy continued to thrive during 1971 as indicated by estimates of the Brazilian Government that the gross national product (GNP) increased by 11.3 percent to approximately $40 billion. Sufficient data were not available to develop the total value of all minerals produced, but the industry's contribution to the GNP will probably remain consistent with former years at slightly under 2 percent.

Decree Law 1173, issued in June, revised

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[1] Supervisory physical scientist, Division of Nonferrous Metals.

Article 10 of the mineral sole tax of October 21, 1969. The decree significantly increases the tax on minerals for domestic use but leaves the tax essentially unchanged for those minerals destined for export.

Decree Law 5740, issued in December, creates a mixed Government-private company, Cia. Brasileira de Tecnologia Nuclear (CBTN), to operate under the Comissão Nacional de Energia Nuclear (CNEN) in certain commercial aspects of nuclear energy. The stated objectives of CBTN are (1) to prospect and mine nuclear and associated mineral deposits through the CPRM by way of service contracts; (2) to promote the development of nuclear energy, through research, studies, and projects on (a) treatment of nuclear and associated minerals as well as production of fuel elements and other materials of interest for nuclear energy; (b) installations for enrichment of uranium and for reprocessing of irradiated nuclear fuel elements; (3) to promote the gradual assimilation of nuclear technology by the national private industry; (4) to construct and operate installations for treatment of nuclear and associated minerals, and installations devoted to the enrichment of uranium. CBTN will have its headquarters in Brasilia and a capital of $18 million. CNEN will maintain at least 51-percent control of the voting shares of CBTN. The company will be directed by a Board of Executive Directors consisting of a president and up to six directors. The president of the CNEN will be the president of CBTN. Only Brazilians can be directors or members of the fiscal council of the company.

PRODUCTION

Mineral and metal production in 1971 recorded gains in many commodities. Noteworthy was the improved output of alumina, aluminum, iron ore, ingot steel, lead, manganese ore, zinc, fertilizer materials, magnesite, and crude petroleum. Table 1 shows mineral production for the years 1969 through 1971.

Table 1.—Brazil: Production of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971 [p]
METALS			
Aluminum:			
Bauxite, gross weight	[r] 362,058	500,000	538,600
Alumina	87,000	118,600	166,800
Metal, primary	[r] 42,545	57,199	80,625
Antimony [2]	104	43	2
Arsenic, white	300	298	148
Beryllium, beryl concentrate, gross weight [3]	3,596	3,333	2,500
Chromium, chromite, gross weight	[r] 18,353	27,614	[e] 28,000
Columbium and tantalum ore and concentrate, gross weight:			
Columbite [3]	69	41	63
Tantalite [3]	203	209	290
Pyrochlore	8,663	13,285	6,094
Copper:			
Mine output, metal content	[r] 2,984	3,840	5,100
Metal, smelter (blister)	3,250	[4] 4,643	3,900
Gold [5] troy ounces	176,925	171,331	157,378
Iron and steel:			
Iron ore and concentrate thousand tons	[r] 27,157	[e] 40,200	[e] 42,700
Pig iron excluding ferroalloys do	3,717	4,205	4,737
Ferroalloys:			
Ferrochromium	2,221	5,871	10,186
Ferrocolumbium	2,128	1,921	1,475
Ferromanganese	[r] 39,343	42,460	72,217
Ferronickel	5,331	11,144	11,124
Ferrosilicon	18,891	18,878	11,451
Silicomanganese	8,276	15,282	18,482
Other	695	651	521
Total	[r] 76,885	96,207	125,456
Steel, raw, excluding castings thousand tons	4,925	5,390	5,997
Steel semimanufactures [6] do	[r] 3,857	3,984	4,612

See footnotes at end of table.

Table 1.—Brazil: Production of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971 [p]
METALS—Continued			
Lead:			
Mine, output, metal content	27,593	27,578	28,302
Metal, smelter, primary	[r] 16,433	19,184	25,646
Manganese ore and concentrate (marketable), gross weight thousand tons	1,691	1,880	2,602
Nickel:			
Mine output, metal content [e]	1,700	2,900	2,800
Ferroalloy, nickel content	[r] 1,334	2,714	2,587
Rare earth, monazite concentrate, gross weight	1,999	2,308	1,363
Silver thousand troy ounces	360	357	624
Tin:			
Mine output, metal content long tons	[r] 3,031	[e] 3,263	[e] 3,199
Metal, smelter, primary do	[r] 2,756	3,156	[e] 3,150
Titanium:			
Ilmenite concentrate, gross weight	20,283	20,644	9,894
Rutile concentrate, gross weight	9	234	117
Tungsten, mine output, metal content	868	1,156	1,398
Zinc:			
Mine	5,400	12,600	[e] 12,600
Smelter	[r] 4,418	8,574	[e] 10,500
Zirconium concentrate, gross weight:			
Zircon	3,129	3,838	4,168
Baddeleyite-caldesite	385	229	328
NONMETALS			
Abrasives, natural n.e.s., corundum and emery	2,740	2,998	[e] 3,000
Asbestos, fiber [7]	13,000	16,000	20,000
Barite [8]	44,000	25,600	42,659
Cement, hydraulic (including pozzolanic) thousand tons	7,824	9,002	9,802
Diamond: [9] [e]			
Gem thousand carats	160	160	160
Industrial do	160	160	160
Total do	320	320	320
Fertilizer materials:			
Crude phosphates, phosphate rock (includes apatite)	[r] 147,000	174,002	219,050
Manufactured, nitrogenous, gross weight	33,909	37,583	78,268
Fluorspar [e]	35,000	35,000	40,000
Graphite, all grades	[e] 2,250	2,500	2,733
Gypsum and anhydrite, crude	[r] 285,644	[e] 290,000	[e] 290,000
Lime thousand tons	[r] 1,731	[e] 1,800	[e] 2,000
Lithium minerals [3]	1,550	[10] 3,651	[10] 6,348
Magnesite [e]	180,000	235,000	269,000
Mica, all grades [3]	1,778	2,019	2,403
Precious and semiprecious stones, except diamond:			
Agate, rough [3]	595	904	791
Other stones, uncut [3]	460	872	1,073
Quartz, crystal, all grades [3]	3,826	5,908	4,588
Salt, marine thousand tons	1,630	1,823	1,477
Stone, n.e.s.:			
Dimension stone, marble	49,832	NA	NA
Crushed and broken, dolomite	706,534	NA	NA
Sulfur, elemental, byproduct	7,250	8,950	9,200
Talc	125,060	[e] 130,000	[e] 130,000
Vermiculite [e]	4,240	4,240	4,240
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	49,500	48,800	57,100
Coal, bituminous (washed) thousand tons	2,436	2,367	2,491
Coke:			
Metallurgical do	1,507	1,615	1,345
Gashouse do	173	187	[e] 162
Gas:			
Manufactured, all types million cubic feet	12,996	14,196	13,349
Natural:			
Gross withdrawal do	44,080	44,638	41,566
Marketed production [e] do	8,000	8,000	8,300
Natural gas liquids thousand 42-gallon barrels	925	956	1,373

See footnotes at end of table.

Table I.—Brazil: Production of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971 p
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum:			
Crude .... thousand 42-gallon barrels	63,045	59,969	62,000
Refinery products:			
Gasoline .... do	53,591	60,083	64,306
Jet fuel .... do	4,420	5,143	5,670
Kerosine .... do	4,977	4,887	4,501
Distillate fuel oil .... do	40,026	43,827	44,555
Residual fuel oil .... do	54,967	54,763	62,354
Lubricants .... do	64	45	16
Other .... do	6,820	6,794	6,332
Refinery fuel and losses .... do	7,556	10,589	6,154
Total .... do	172,421	186,131	193,888

e Estimate. p Preliminary. r Revised. NA Not available.

[1] In addition to the commodities listed, molybdenite, feldspar, and a variety of crude construction materials (common clay, sand and gravel, and stone) are also produced, but output is not reported and available information is inadequate to make reliable estimates of output levels.

[2] Includes small quantity of metal contained in antimonial lead.

[3] Exports.

[4] Includes secondary.

[5] Officially reported and estimated. Much placer gold produced eludes statistical coverage.

[6] Excludes castings and forgings.

[7] As reported by one major producer in Brazil. Asbestos is produced in three other States, but data are not available.

[8] Includes both ore and concentrate.

[9] By far the larger part of Brazil's diamond production is not reported statistically; hence the estimates tabulated are based only on very general market information.

[10] 1970—of which 2,500 metric tons petalite exported; 1971—petalite exported.

TRADE

In terms of value, there was no important change in the direction of foreign trade. The United States remained Brazil's principal supplier as well as the best customer for Brazil's exports. Western Germany ranked second for both imports and exports. Detailed trade statistics for 1971 are not available but in 1970, mineral and metal exports accounted for 15 percent of total exports while imports of minerals and metals accounted for 29 percent of all imports.

Iron ore exports, valued at $237.3 million, were the highest ever recorded for that commodity, and in terms of value ranked second after coffee. Manganese was the ninth ranked raw material export with a value of $37.7 million. In comparison, imports of crude oil alone were valued at $403.4 million and, in addition, $72 million was expended for refined petroleum products.

The following table shows total visible foreign trade compared with trade in mineral and metal commodities for 1968, 1969, and 1970:

	Value (million dollars)	
	Mineral commodity trade	Total commodity trade
Exports:		
1968	177	1,881
1969	245	2,311
1970	423	2,739
Imports:		
1968	598	2,132
1969	663	2,265
1970	823	2,849

Table 2.—Brazil: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum:			
Bauxite and concentrate	2,720	3,414	Uruguay 1,900; Argentina 1,510.
Oxide (alumina) and hydroxide	156	238	Mexico 128; Argentina 74.
Metal including alloys:			
Unwrought	160	5	Mainly to Paraguay.
Semimanufactures	10	18	Do.
Antimony, metal, crude	--	14	Chile 7; Colombia 7.
Beryl, ore and concentrate	3,596	3,333	Mainly to United States.
Chromium, ore and concentrate	--	160	All to Argentina.
Columbium and tantalum, ore and concentrate:			
Columbite and tantalite	272	250	United States 184; Netherlands 31.
Pyrochlore	5,741	8,500	West Germany 1,830; United States 1,750; United Kingdom 1,675; Belgium-Luxembourg 1,200.
Copper, metal, including alloys	358	962	Belgium-Luxembourg 330; Uruguay 228; West Germany 207.
Iron and steel:			
Ore and concentrate__thousand tons	21,478	27,943	Japan 7,086; West Germany 6,846; Belgium-Luxembourg 1,987; United States 1,849; United Kingdom 1,580.
Metal:			
Scrap	^{r}468	463	Argentina 260; Sweden 102.
Pig iron and similar materials	49,877	165,842	Japan 118,457; People's Republic of China 20,249.
Ferroalloys:			
Ferromanganese	150	4,570	Venezuela 3,899; Colombia 500.
Ferrosilicon	330	1,417	Venezuela 1,325; Uruguay 90.
Ferrochrome	390	2,320	Netherlands 930; United Kingdom 800; Argentina 315.
Ferrocolumbium	2,086	--	
Ferronickel	2,129	7,400	Japan 3,761; Belgium-Luxembourg 1,632; Netherlands 678.
Other ferroalloys	--	2,011	United States 909; Netherlands 550; Sweden 187.
Steel:			
Primary forms, ingot	117,750	212.137	Argentina 172,949; Uruguay 12,072.
Semimanufactures	211,817	374,162	Algeria 106,444; Argentina 80,376; Spain 27,170; Uruguay 22,117.
Lead, ore and concentrate	4,000	4,500	All to United States.
Manganese, ore and concentrate	860,619	1,588,079	United States 702,292; Netherlands 238,294; Canada 135,249.
Nickel	98	1	Mainly to United States.
Rare-earth metals, ferrocerium__kilograms	1,000	2,000	All to Argentina.
Tin metal and alloys, unwrought long tons	413	1,051	Argentina 553; United States 320.
Titanium oxide	--	6	All to Switzerland.
Tungsten:			
Ore and concentrate	1,408	1,640	Netherlands 1,026; West Germany 340.
Metal, including alloys, all forms kilograms	1,566	1,874	United States 952; Switzerland 463; Argentina 292.
Zinc, metal, including alloys	295	103	Mainly to Belgium-Luxembourg.
Zirconium and hafnium, ore and concentrate	10	--	
Other:			
Ore and concentrate	--	40	Netherlands 20; West Germany 20.
Ash and residues, containing nonferrous metal	^{r}25	29	Mainly to Belgium-Luxembourg.
Metals, including alloys, all forms	^{r}1	11	Mainly to Sweden.
NONMETALS			
Abrasives, emery and corundum [1]	1,335	2,110	Argentina 1,291; Mexico 572; Colombia 136.
Barite	18,292	18,342	Venezuela 12,196; Trinidad and Tobago 6,146.
Cement	1,412	557	Bolivia 370; Paraguay 186.
Clays and products:			
Crude n.e.s., kaolin	825	1,503	Uruguay 1,400; Chile 100.
Products, refractory	1,697	3,267	Mainly to Paraguay.
Diamond:			
Gem, uncut and cut, but unset carats	25,210	20,865	United States 16,325; Netherlands 3,140.
Industrial__do	21,945	25,695	United States 19,140; Netherlands 3,105.
Feldspar	--	2	All to Sweden.
Fertilizer materials, manufactured	523	91	Mainly to Paraguay.
Fluorspar	10,337	20,650	Netherlands 11,000; United States 9,650.
Graphite	--	12	Switzerland 8; United States 2.

See footnotes at end of table.

Table 2.—Brazil: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
NONMETALS—Continued			
Lime	13	15	All to Paraguay.
Magnesite	10,945	17,513	Argentina 4,280; Spain 4,100; France 3,252.
Mica, all forms	1,779	2,027	Norway 750; United States 684; West Germany 300.
Precious and semiprecious stones kilograms	460,258	756,721	United States 334,036; West Germany 266,646.
Salt	1	7	All to Paraguay.
Stone, sand and gravel: Dimension stone:			
Crude and partly worked	12,185	14,029	Italy 6,777; United States 2,653; Japan 2,547.
Worked	1,390	1,458	Mainly to Argentina.
Other	67	--	
Talc, steatite, soapstone, and pyrophyllite	726	597	Colombia 545; Argentina 50.
Other nonmetals, n.e.s.:			
Agate, rough kilograms	595,077	904,109	United States 339,149; Japan 310,345; West Germany 114,318.
Lithium mineral:			
Spodumene	50	--	
Other	1,500	3,651	Netherlands 3,050; United States 301.
Quartz crystal:			
Electronic and optical grade	75	176	Japan 59; Switzerland 38; United States 33; Italy 21.
Other	3,751	5,732	West Germany 2,014; Japan 1,629; France 895; United Kingdom 621.
Slag, not metal bearing	295	101	Mainly to Belgium-Luxembourg.
Other [2]	10	29	Mainly to United Kingdom.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	1,101	1,122	Uruguay 991; Chile 127.
Coal, coke and lignite	--	10	All to Paraguay.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	--	479	All to Bahamas.
Refinery products:			
Kerosine do	r 805	888	All to Trinidad and Tobago.
Distillate fuel oil do	r 220	877	Netherlands Antilles 536; Argentina 340.
Residual fuel oil do	--	4,750	Netherlands 1,742; Netherlands Antilles 1,008; United States 653.
Lubricants do	(3)	(3)	Mainly to Sweden.
Other do	16	45	Mainly to Argentina.

r Revised.

[1] Excludes diamond and rough agate.

[2] Includes material not identified by commodity in source and commodities not listed separately in table.

[3] Less than ½ unit.

Table 3.—Brazil: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum:			
Bauxite and concentrate	--	1,616	All from Surinam.
Oxide (alumina)	1,084	1,113	West Germany 651; United States 400.
Metal:			
Scrap	--	8	All from United States.
Unwrought	49,271	28,437	United States 15,965; Canada 7,012.
Semimanufactures	4,929	4,114	France 1,411; Belgium-Luxembourg 895; United States 871.
Antimony:			
Ore and concentrate	185	96	Peru 91; Austria 5.
Metal, including alloys, all forms	259	49	Mainly from Denmark.
Arsenic, trioxide and regulus	279	492	France 137; Sweden 127; West Germany 110.
Bismuth, metal, including alloys, all forms kilograms	11,508	14,067	Mexico 9,250; United States 2,003.
Cadmium metal, including alloys, all forms do	68,644	45,172	Mexico 40,618.
Chromium:			
Chromite	7,324	8,245	Philippines 7,600; Republic of South Africa 390.
Metal, including alloys	12	15	Japan 8; United Kingdom 3; United States 2.

Table 3.—Brazil: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS—Continued			
Cobalt:			
Oxide and hydroxide	59	56	Mainly from West Germany.
Metal, including alloys, all forms	102	148	Mainly from Belgium-Luxembourg.
Columbium and tantalum, metal	--	1	Mainly from United States.
Copper:			
Copper sulfate	2,236	2,669	Peru 1,155; Chile 926; Argentina 295.
Metal:			
Scrap	306	264	United States 215; Bolivia 41.
Unwrought:			
Refined, unalloyed	47,082	50,637	United States 18,815; Chile 11,029; Zambia 6,446.
Alloys	10	8	Mainly from United Kingdom.
Semimanufactures	911	2,573	Chile 1,404; United Kingdom 453; United States 220.
Gold, metal, unworked or partly worked troy ounces	39,148	121,954	United Kingdom 67,063; Canada 37,777.
Iron and steel:			
Ore and concentrate	7	1	Mainly from West Germany.
Metal:			
Scrap	47	84	All from United States.
Sponge iron, powder and shot	1,837	2,008	Mainly from United States.
Ferroalloys	3,485	4,983	United States 1,201; Republic of South Africa 1,149; Argentina 813.
Semimanufactures	387,340	462,792	Japan 192,535; West Germany 97,858; United States 47,196.
Lead:			
Oxides	935	322	Mexico 275; West Germany 22.
Metal, including alloys, all forms	12,624	1,382	Mainly from Mexico.
Magnesium metal, including alloys, all forms	5,217	6,765	United States 5,286; Norway 1,459.
Manganese:			
Ore and concentrate	3,421	541	Mainly from Republic of South Africa.
Oxide	803	1,350	Mainly from Japan.
Metal	223	215	France 73; Republic of South Africa 55; United States 50.
Mercury 76-pound flasks	1,683	3,104	Mainly from Mexico.
Molybdenum:			
Ore and concentrate	205	312	Canada 232; United States 75.
Metal, including alloys, all forms	11	13	Netherlands 6; United States 5.
Nickel, metal:			
Unwrought	320	655	United States 326; Netherlands 135; Canada 106.
Semimanufactures	687	767	United States 327; France 134.
Platinum-group metals, including alloys, all forms:			
Platinum [1] troy ounces	3,059	6,495	West Germany 4,671; United States 1,582.
Other do	3,954	12,216	United States 8,828; West Germany 1,351.
Radium milligrams	100	--	
Rare-earth metals grams	115	861	Mainly from United States.
Selenium, elemental kilograms	6,406	7,464	United States 3,522; Canada 2,085.
Silicon, metal	1,276	1,327	Norway 628; France 553; United States 130.
Silver, metal, including alloys thousand troy ounces	[r] 1,228	1,718	Peru 577; West Germany 501; United States 301.
Sodium, metal kilograms	3,163	12,890	Mainly from West Germany.
Tellurium, elemental do	2	123	Peru 50; United States 46.
Tin:			
Ore and concentrate long tons	[r] 386	--	
Oxides do	63	63	West Germany 33; United Kingdom 30.
Metal, including alloys, all forms do	8	7	Mainly from United States.
Titanium:			
Ore and concentrate, rutile	1,192	11,170	Mainly from Australia.
Oxides	16,212	18,307	United Kingdom 6,386; West Germany 4,120; Finland 2,958; France 2,070.
Tungsten	11	10	United States 5; Netherlands 2.
Uranium and thorium, isotopes and compounds value	$961,657	$481,740	Mainly from Belgium-Luxembourg.
Zinc:			
Oxide	100	128	West Germany 65; United States 48.
Metal:			
Unwrought	55,677	43,977	Mexico 11,972; Peru 11,868; Canada 5,659; Argentina 2,414.
Semimanufactures	47	49	Mainly from Japan.
Zirconium and hafnium, ore and concentrate	4,639	2,507	Australia 2,473; United States 34.
Other [2]	252	181	West Germany 111; United States 59.

See footnotes at end of table.

Table 3.—Brazil: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, tripoli, etc	1,047	1,063	Mainly from United States.
Grinding flints	104	524	Mainly from France.
Dust and powder of precious and semiprecious stones grams	54,267	44,712	Denmark 24,632; United States 12,738.
Asbestos	20,703	23,413	Canada 17,385; Republic of South Africa 3,683.
Barite	25	30	Mainly from United States.
Boron materials:			
Crude natural borates	2,679	3,452	Do.
Oxide and acid	1,385	1,717	Do.
Bromine kilograms	209	22,214	Mainly from Israel.
Cement	609,359	334,510	Uruguay 112,800; U.S.S.R. 81,129; Colombia 52,706.
Chalk, natural	2,859	3,084	France 1,647; Belgium-Luxembourg 669; East Germany 560.
Clays and products:			
Crude, n.e.s.:			
Bentonite	9,837	9,911	United States 7,632; Argentina 2,277.
Fire clay	77	100	United States 45; West Germany 30.
Kaolin	2,364	6,235	Mainly from United States.
Other	654	1,079	Do.
Products, refractory	12,679	16,504	United States 8,114; France 2,618; West Germany 2,489.
Cryolite, natural	1,160	2,171	Mainly from Denmark.
Diamond:			
Gem, not set or strung carats	1,000	9,675	Mainly from United States.
Industrial do	7,810	8,175	All from United States.
Diatomite, and other infusorial earths	988	1,234	United States 839; West Germany 274.
Fertilizer materials:			
Crude:			
Nitrogenous, nitrates, natural	34,843	23,710	All from Chile.
Phosphatic, phosphate rock	310,120	428,158	United States 357,138; Morocco 55,206.
Manufactured:			
Nitrogenous	528,949	840,659	United States 374,158; West Germany 256,852; Netherlands 157,625.
Phosphatic:			
Thomas slag	8,457	7,998	West Germany 4,030; Belgium-Luxembourg 3,968.
Other	260,521	477,121	Mainly from United States.
Potassic	332,890	511,235	United States 150,556; West Germany 145,199; Israel 79,242.
Other, including mixed	19,277	15,594	Chile 9,432; West Germany 5,600.
Ammonia	10	25,515	Mainly from United States.
Graphite, natural	113	191	Mainly from West Germany.
Gypsum and plasters	3,122	1,088	Mainly from Bolivia.
Iodine kilograms	27,104	40,534	Chile 27,150; Argentina 5,800; Belgium-Luxembourg 3,863.
Mica:			
Crude, including splittings and waste do	9,826	21,350	United States 11,350; United Kingdom 10,000.
Worked do	7,407	18,966	Sweden 11,412; United States 6,394.
Phosphorous, elemental	94	104	United Kingdom 46; West Germany 37.
Pigments, mineral, including processed iron oxides	[r] 1,695	2,088	West Germany 1,359; Spain 521.
Precious and semiprecious stones, except diamond grams	176,371	353,588	Sweden 160,780; West Germany 110,442; Israel 37,000.
Pyrite, gross weight	1,520	24	United States 16; West Germany 8.
Salt	6	4	United States 2; West Germany 1.
Silex or flint	104	524	Mainly from France.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	105,065	164,185	United States 91,157; Italy 20,296; France 13,918.
Caustic potash	1,053	2,251	United States 827; France 752; West Germany 255.
Soda ash	281	3,097	Mainly from France.
Sodium sulfate	26,023	35,594	Mexico 23,073; Chile 12,350.
Stone, sand and gravel:			
Dimension stone, marble	404	1,019	Italy 731; Romania 209.
Dolomite	1,023	1,247	Mainly from Italy.
Quartz and quartzite	66	11	Italy 5; Sweden 5.
Other	513	465	Colombia 213; United States 192.
Sulfur, elemental, all forms	218,086	261,611	Mainly from United States.
Talc, soapstone, and pyrophyllite	1	91	Do.
Other nonmetals	35	15	Do.

See footnotes at end of table.

Table 3.—Brazil: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	549	864	United States 707; Argentina 92.
Carbon black	4,657	4,956	United States 2,198; Argentina 1,135; West Germany 765.
Coal, all grades, including briquets	1,921,382	1,988,624	Mainly from United States.
Coke and semicoke	88,175	112,292	United States 75,297; West Germany 23,392.
Petroleum:			
Crude...thousand 42-gallon barrels	98,884	117,454	Saudi Arabia 24,295; Iraq 23,834; Venezuela 16,132; Nigeria 13,602.
Refinery products:			
Gasoline do	2,578	662	All from Netherlands Antilles.
Kerosine do	101	64	Do.
Lubricants do	1,929	2,967	Mainly from United States.
Liquefied petroleum gas (LPG) do	4,889	4,362	Venezuela 3,014; Saudi Arabia 932.
Mineral jelly and wax do	r 152	64	United States 30; Japan 12; West Germany 4.
Other:			
Petroleum coke	25,476	39,221	United States 35,212; Argentina 4,004.
Bitumen and other residues	139	2,211	Mainly from United States.
Naphtha thousand 42-gallon barrels	--	10,978	Saudi Arabia 3,507; Trinidad and Tobago 2,304; Venezuela 2,230.
Mineral tar and other hydrocarbon-based chemicals	r 1,057,302	113,055	Venezuela 62,831; United States 43,800.

r Revised.

[1] Excludes jewelry and other ornamental items.

[2] Includes some material not identified by commodity in source, and commodities not listed separately in table.

COMMODITY REVIEW

METALS

Antimony.—Although very little antimony is mined in Brazil, a few tons were produced in a flurry of activity during a short period late in 1971 from a locality near Belo Horizonte. The material occurring with calcite and containing as much as 8 percent iron was found to be difficult to process. During the year, Tinplo Industrial de Antimonio, S.A., constructed an antimony-smelting facility in the Ipiranga District, São Paulo, with an installed capacity of 45 tons of 99.6 percent antimony metal monthly. The plant reportedly can utilize ores or concentrates averaging under 30 percent, and thus the company has been able to make favorable negotiations with Bolivian sources for ores that otherwise are not easily marketable. First tests of this plant were made with the domestic antimony ore from the Belo Horizonte source but, although it was smelted successfully, the high-iron impurity made it unfeasible to continue with this material. Tinplo has under study a plan for a smelter in Manaus with a 3,600-metric-ton-per-year capacity to produce metal and oxide.

Arsenic.—Arsenic is produced as a byproduct from gold ore containing arsenopyrite. The entire output of 148 tons came from the Morro Velho gold mine near Belo Horizonte operated by the Mineração Morro Velho, S.A.

Bauxite.—Probably the most intensely competitive exploration underway during the year was for bauxite in the Amazon region. Efforts were expended in three areas of the basin. The area of the Trombetas River northwest of Obidos, Pará, was the site of a major find in 1967 by geologists of the Aluminium Company of Canada Ltd. (ALCAN). Since that time, the area has been intensely prospected by such companies as the Aluminum Company of America (ALCOA), National Bulk Carriers, Kaiser Aluminum & Chemical Co., Reynolds Metals, Alusuisse, and Péchiney. The most advanced of the projects in this area was that of Mineração Rio do Norte, S.A., a subsidiary of ALCAN, where mine development and port facility construction was underway with a 1974 goal for the export of bauxite at a 2-million-ton-per-year rate. However, about mid-1972, the company decided to suspend activity temporarily because of oversupply of bauxite on the world market.

South of the Amazon and to the east,

about a third of the way down the highway from Belém to Brasilia, in a second area known as the Paragominas region, discoveries were being studied by Kaiser Aluminum, Rio Tinto Zinc, CPRM, and others. Government sources have estimated bauxite reserves in this area at 400 million tons.

In the Amapá territory northwest of Belém, the Shell-Billiton group reportedly was preparing for a big bauxite exploration effort.

Bauxite was produced by three major firms and one small producer in the Ouro Prêto and Poços de Caldas districts of Minas Gerais. Approximately 538,600 tons of bauxite containing an average of 20 percent moisture was produced and used for the production of 166,800 tons of alumina.

Cadmium.—Cadmium was produced for the first time in Brazil in 1971. The Cia. Mercantil e Industrial-Ingá began recovery of cadmium in a small electrolytic plant adjacent to the company's zinc-recovery operation on the Ilha da Madera in Sepetiba Bay, Rio de Janeiro. The quantity produced in the usual commercial stick form was not large and was stockpiled pending a favorable price level.

Chromium.—The Cia. de Ferro Ligas da Bahia, S.A. (FERBASA), continued to be the principal producer of chromite ore and ferrochromium. Early in 1972, following an extended period of negotiations started in 1971, FERBASA reached agreement with Japanese groups to form a new enterprise called Cia. de Mineração Serra da Jacobina (SERJANA), which will conduct extensive exploration for new chromite deposits. The Japanese consortium, Brazilian Chrome Resources Development Co., Ltd., will advance all capital but FERBASA will retain control with 51 percent of the shares. The Japanese will have a favored position for exports and 49 percent of the SERJANA profits. FERBASA reportedly will furnish necessary capital for another company to prospect for chromite deposits in northeastern Bahia. FERBASA plans to increase its low-carbon ferrochromium production with the installation of a 3,500-kilowatt electric furnace. Production from the enlarged plant will be on the order of 5,000 metric tons per year.

Iron Ore.—Another record year was established for Brazilian iron ore with a gain of 6 percent in production and 11 percent in exports. CVRD continued to be the largest iron ore mining and exporting company by a wide margin. This firm exported for its own account 80 percent of the total Brazilian iron ore exports, and also shipped an additional 9 percent for the account of S.A. Mineração Trindade (SAMITRI) and Ferteco, S.A., all through the port of Tubarão. The CVRD also made domestic shipments of 1.34 million tons, almost entirely to Usinas Siderúrgicas de Minas Gerais (USIMINAS). In December, CVRD established a new world record by loading the largest single cargo of iron ore ever shipped. The 149,588-ton cargo of ore was for delivery to Nippon Steel Corp. in Japan.

During the first full year of operation of the iron ore pelletizing plant at Tubarão, 1.5 million tons of pellets were exported and 84,000 tons were shipped to domestic consumers. The pellet plant is being expanded to a 3.2-million-ton capacity and is to be in operation in 1973. Work was continued on the expansion of the Tubarão port to accommodate 250,000-deadweight-ton ore carriers and to increase the shiploading capacity to 30,000 tons per hour. The expansion project is being conducted in accordance with a master plan consisting of a staged program to increase annual iron ore shipments to 80 million tons and accommodation of vessels up to 400,000 deadweight tons.

SAMITRI was second in importance among iron ore producers. SAMITRI reported a record total of shipments of 3.7 million tons including 1.4 million tons from the newly developed Alegria mine. As one of the first steps toward the full development of the Alegria mine, a contract has been awarded to Kaiser Engineers International, Inc., to study the economic feasibility and to prepare detailed plans for producing 4 million tons of ore annually on a one-shift-per-day basis. The 4-million-ton-per-year level will be reached in 1973 and can then be doubled by adding another shift.

The merger plan whereby Cia. Mineração Novalimense (Hanna Mining Co. interest) would be absorbed into the Antunes group interest Minerações Brasilieras (MBR) on a 49- to 51-percent basis was completed early in the year. Completion of the merger opened the way for a project to mine and export 10 million tons of iron ore annually from the Aguas Claras mine near Belo Horizonte. The engineering, procurement, and project coordination services will be performed by Bechtel Corp.'s Mining and Metals Division under a contract awarded to Bechtel Overseas Corp. and to Bechtel do Brasil Construções, Ltda., a Bechtel affiliate. The ore deposit is estimated to contain more than 370 million tons of recoverable ore with iron content averaging 67 percent. Included in the development scheme is a separate marine terminal at Guaiba Island about 50 miles southwest of Rio de Janeiro near the entrance to Sepetiba Bay. Excavation, fill work, and leveling at the open pit mine began in October. Primary crushing, stockpiling, screening and washing, storage and reclaiming, and railroad-loading facilities will be built at the mine site. Ore will be transported 400 miles from the mine to the marine terminal by unit trains over an existing railroad. Expected turnaround time between the two points is about 3 days. A mile-long railroad trestle and causeway will connect Guaiba Island terminal and the mainland. The ore will be either stockpiled at the terminal in a 1.5-million-ton capacity stockyard or conveyed directly to ore carriers. A 1,295-foot pier to be constructed at the terminal will provide two berths for ore carriers, one of which will accommodate ships with a deadweight capacity of up to 250,000 tons. The total cost of the MBR project is estimated at about $150 million, with funds provided as follows: $50 million from the World Bank; $50 million from a group of five Japanese trading companies; $30 million of new capital funds from the partnership groups; and a minimum of $20 million from the Export-Import Bank and other sources. Long-term ore sales agreements have been completed with 7.3 million tons to be delivered to five Japanese steel companies, 1.3 million tons to the British Steel Corp., and 700,000 tons to Sociedad Mixta Siderúrgia Argentina (SOMISA) in Argentina. Additional spot sales of 700,000 tons will absorb the balance of initial planned minimum production of 10 million tons. Shipments are expected to start from the Sepetiba terminal in 1974. Environmental safeguards are to be incorporated into the mining operations and at the Sepetiba Bay marine ore loading terminal.

Amazônia Mineração, S.A. (CVRD, and Cia. Meridional de Mineração, a United States Steel subsidiary) continued its program of exploration at its iron ore deposits in the Serra Dos Carajas, Pará. Preliminary studies of the problems involved in mining and transportation of iron ore at this remote location were initiated.

Iron and Steel.—Brazilian production of 6.00 million metric tons of steel ingots in 1971 broke the previous record of 1970 by 11 percent. Output of rolled steel advanced 13 percent and pig iron 13 percent to establish also new highs. Steel consumption rose 29 percent during the year, pulling imports higher by 84.3 percent on a tonnage basis and 35.8 percent on a value basis, according to the National Steel Council. Exports dropped 53.6 percent because of higher internal demand and smaller demand abroad.

A large steel expansion plan announced early in the year by the National Steel Council, Conselho Consultivo da Industria Siderúrgica (CONSIDER), gathered momentum slowly during the year, and although some financing for equipment purchases was obtained, actual acquisition of equipment and placing it in operation were slower than planned. The Brazilian steel plan is based on major objectives for a 12.5-million-ingot-ton steel capacity by 1975 and a 20-million-ton capacity by 1980 to face a domestic demand estimated by the Brazilian Steel Institute at 9.5 million and 15.3 million tons, respectively. Excess capacity above domestic consumption requirements is required to handle the growing flow of exports and to meet possible peaks in domestic demand.

The three major Government-owned steel plants, Cia. Siderúrgica Nacional (CSN), USIMINAS, and Cia. Siderúrgica Paulista (COSIPA) are expected to produce about 11 million of the 20-million-ton objective, and the other 9 million tons will come from smaller plants now in operation plus new plants being planned or built. In addition to the three plants named above, there are nine other fully integrated steel mills in Brazil ranging in size from 13,000 tons of ingots per year to 500,000 tons per year. There are also 24 producers of ingots and shapes, plus two which produce only pig iron and cast iron pipes and pieces. At present, there are nine new plants under construction or planned, which will produce ingots and shapes, some of them concentrating on special steels.

According to the CONSIDER plan, CSN will increase ingot capacity from 1.4 million tons in 1970 to 1.7 million tons in 1972, then 2.5 million tons in 1976, and 4 million tons in 1980. COSIPA will increase capacity from 600,000 tons in 1970 to 1 million tons in 1972, then 2.3 million tons in 1976, and

3.5 million tons in 1980. USIMINAS will increase from 800,000 tons in 1970 to 1.4 million tons in 1972, then 2.4 million tons in 1976, and 3.5 million tons in 1980.

To enable it to reach planned expansion goals, CSN will add a battery of 81 coke ovens; a blast furnace with a 6,000-ton-per-day capacity; a sinter plant which is to produce 5,000 tons per day; an air separation plant with a 600-ton-per-day capacity for gaseous oxygen and a 50-ton-per-day capacity for liquid oxygen; and a continuous slab caster with an initial capacity of 950,000 tons per year. Costs for this and complementary equipment are estimated to be $410 million.

The second largest steel company in Brazil, USIMINAS, will add a blast furnace of 2,500 cubic meters inner volume, gas cleaning equipment, ladles, cranes, a rotary kiln of 300-ton-per-day capacity, a slab reheating furnace of 200-ton-per-hour capacity, and an annealing furnace, an oxygen plant, locomotives and rail cars plus related equipment in the electrical and mechanical field. This project will cost about $300 million, much of which will probably be supplied either by the Japanese partners or through Japanese banks.

COSIPA has the largest blast furnace in Latin America and is to add an even larger one to handle the planned increase from 500,000 tons to 1.8 million tons by 1975. About $400 million will be spent on the first expansion phase to purchase two coke oven batteries with 53 ovens each, one blast furnace of 83,000 cubic feet, two oxygen compressors, one slab reheating furnace of 100-ton-per-hour capacity, a 160-inch plate mill, four annealing furnaces, and other complementary equipment.

At the close of the year, CONSIDER established priority for seven projects totaling $100 million for expansion of facilities in the private steel sector. In addition, CONSIDER approved the project of the Cia. Siderúrgica da Guanabara (COSIGUA) with a projected initial annual production of 250,000 tons of machine wire, bars, and drawn wire. This mill, to be located just south of the city of Rio de Janeiro, is a joint venture of the Gerdau group of Rio Grande do Sul and Thyssen of Duesseldorf, West Germany. The company plans to produce 600,000 tons of ingots and shapes by 1976 and 2 million tons by 1981. Investment will be about $500 million. A second mill is under consideration by the same group to be built near Vitória in the State of Espírito Santo, with a capacity of 1.8 million tons.

In southern Brazil, the new specialty steel mill of Aços Finos Piratini, S.A., financed with British funds, was rapidly nearing completion. It will have an initial capacity of 60,000 tons, which may be expanded to 180,000 tons, mainly stainless steel. In Salvador, Bahia, the Usina Siderúrgica da Bahia is installing an $80 million mill to produce 280,000 tons of ingots and semifinished products. The company has signed an agreement to use the HyL process of Hojalata y Lámina, S.A., of Mexico, for reducing iron ore. This appears to be the first time that Mexican steel technology is being used by a major foreign project.

Nickel.—Investigation of the technical and economic feasibility of developing nickeliferous mineralized areas in Goiás near Niquelândia and Barro Alto continued during the year. According to CPRM reserves in the area were estimated to approach 100 million tons of 1.0 to 2.0 percent nickel. While these deposits might be of interest for the production of ferronickel, the copper content is high enough to make such a product marginal for acceptance by the steel industry. Canadian technicians were reported to be working with Industrias Votorantim on engineering plans for the construction of a pilot plant which would produce metallic nickel at an annual rate of 2,500 metric tons beginning in 1974. Morro do Niquel, S.A., reported mining better than 200,000 tons of 1.5 percent nickel ore at Pratápolis, Minas Gerais, for the production of 10,000 tons of ferronickel containing 24.6 percent nickel. Cia. de Nickel do Brasil, with mine and plant at Liberdade, Minas Gerais, produced a reported 314 metric tons of 23.9 percent ferronickel from 6,457 tons of ore averaging 1.8 percent nickel. Brazilian exports of ferronickel in 1970 totaled 7,400 tons, of which about one-half went to Japan.

Thorium.—During 1971, CNEN continued to process monazite from beach sands at its São Paulo plant. The plant is operated by the Administração da Produção de Monazita (APM) for the production of rare-earth salts. All sands treated came from plants at Itabapoana, Rio de Janeiro; Cumuruxatiba, Bahia; and Guarapari, Espírito Santo. The CNEN operated the first two separation plants, and a private firm operated the third plant under a CNEN contract. In July, the operational control of all beach sand operations passed from the CNEN to the APM. The contract of the private firm was continued under the direction of APM.

Tin.—Brazilian tin production totaled an estimated 5,000 metric tons of cassiterite concentrate containing about 65 percent tin and 3,200 tons of refined tin. The concentrate came primarily from the Rondônia tin district. Production dropped somewhat during the year but not to the extent expected. However, it is anticipated that output will be lower in 1972 but will increase again by 1973. The most active area in the Rondônia District is known as the Rio Roosevelt in Mato Grosso. In this District, the Cia. Estanífera do Brasil (CESBRA)-Patiño group, Best Metais, and Cia. Minerais Amazonenses have been doing intensive exploration work. The Itaú-NL Industries group has been exploring at several localities in the District but had not begun production by yearend. W. R. Grace & Cia.-CESBRA continued successful operation of a small 4-cubic-foot bucket-line dredge in Rondônia and was considering placing another dredge in operation. The Cia. Industrial Fluminense continued to operate mines in Rondônia through associated companies Mineração Jacundá and Mineração Lourenço. Mineração Aripuana, S.A., was operating at Igarapé Prêto, Amazonas, but production by yearend had not reached the projected output rate of 300 to 400 tons of concentrate per month.

Five tin smelters operated during the year. The largest producer, CESBRA, produced 831 tons of refined metal at its Volta Redonda plant, 16 percent less than the previous year. Cia. Industrial Amazonense (CIA), in Manaus, produced 802 tons which was also below the 1970 level and well below its present 2,900-ton annual capacity. The company has under construction in Manaus a new plant with an additional annual capacity of 400 metric tons of tin and 200 tons of tin alloys. When the entire operation is integrated, the total capacity for metallic tin will approach 3,300 tons per year. Cia. Industrial Fluminense, using concentrates from Rondônia, produced 517 tons at its plant near São João del Rei, Minas Gerais. The plant was being partially converted for the production of metallic silicon by the end of 1972 at which time the tin unit will process only concentrates from São João del Rei mines, and the Rondônia material will go to the CIA plant in Manaus. Best Metais e Soldas, S.A., continued operation of its small unit in São Paulo. The Swedish-owned Bera do Brasil Metalurgia e Comercio de Metais, Ltda., operated a 1,200-ton-per-year-capacity smelter in São Paulo. The smelter produces 99.9 percent refined tin, all from Brazilian concentrates. This smelter began operating in a small way in 1969, and by yearend 1971 had reached a near capacity level of output.

Titanium.—Titânio do Brasil, S.A. (TIBRAS), started sulfuric acid production at its plant site near Salvador, Bahia, in February, and began experimental production of titanium dioxide in April. Commercial production did not begin until October. Both the sulfur for the acid plant and ilmenite for the TiO_2 plant were imported, the latter from Australia on a duty-free entry basis. The spent acid and other wastes from the plant are transported out to sea via a 2-kilometer-long submerged pipeline. Although the company considers that the problem of pollution will be minimal, TIBRAS signed a contract in June with Hidroley (Hidrografia Levantamentos Oceanografia), Ltda., to study possible deleterious effects of the plant effluent. No further development work took place at the large titanium deposit at Tapira, near Araxá, but efforts were concentrated on research toward solving the complex metallurgical problems involved in recovering the titanium which occurs with pyrochlore, rare earths, and phosphates.

NONMETALS

Asbestos.—The Cana Brava deposit at Uruaçú, Goiás, operated by Sociedade Anônima Mineração de Amianto, was the source of about 85 percent of the 20,000 tons of asbestos produced in the country. The company anticipates that its production will increase to 27,000 tons in 1972. However, even this marked increase in productivity will be insufficient to supply domestic demand which was estimated in 1970 at about 40,000 tons.

Barite.—Production of bulk and ground barite increased about 67 percent above the 25,600 tons produced in 1970. Exports increased moderately with almost all the bulk material going to Trinidad and Venezuela. The ground product was sold entirely to the Brazilian market. Pigmentos Minerais Industrial e Comercial Pigmina, S.A., continued to be the principal producer from its Camamú Island deposit off the coast of Bahia. Bentonita União of Campina Grande, Paraiba, operated small properties in the area during the year and produced an estimated 2,400 tons of barite for use as drilling mud. Brazilian barite reserves and plant capacity are more than adequate for the domestic market.

Cement.—Cement production again broke all records with a 9-percent advance over 1970 production. Actual output represented only about 78 percent of an installed capacity of 12.5 million tons. Production was supplemented by imports of 276,499 tons, primarily from the U.S.S.R., Uruguay, and Colombia. Thirteen new plants were reportedly under construction at the end of the year, and four additional plants were planned for construction.

Fertilizer Materials.—Brazil's fertilizer industry is one of the fastest growing sectors of a rapidly expanding chemical industry, with imports taking a large share of the market. Within Brazil, there are three fertilizer markets, each with its own supply, industry, and distribution system. The transfer of products from one region to another is an exception rather than the rule. This situation is likely to change in the future with urea from a plant in Bahia and phosphate and ammonium nitrate from São Paulo being marketed in other regions.

The three separate markets are: the north region, which is concentrated in Recife and covers all the States served by seaports from Belém to Vitória; the center region covers all the States served by seaports from Rio de Janeiro to Santa Catarina with the main activity centered around São Paulo; and the southern region covers the State of Rio Grande do Sul and includes adjoining areas of Santa Catarina. This marketing region is centered on Rio Grande and Porto Alegre. Perhaps the biggest problem facing the marketing of fertilizer is not one of prices or production but poor transportation facilities both by road and rail.

The largest domestic demand for fertilizers comes from the center region, accounting for about 70 percent of Brazil's total, followed by the south with around 23 percent. The country's total fertilizer consumption has more than tripled during the last 10 years although in the south, it has increased 510 percent due to the expansion of wheat growing. Consumption of nitrogen has shown the greatest increase, up 400 percent in the last 10 years. Total phosphorus demand has increased 350 percent, while potash consumption increased 360 percent.

Nitrogen production is based mainly in the central and northern sectors. The Cubatão fertilizer plant of Petróleo do Brasil (PETROBRÁS) produced 179,600 tons of nitrogenous products during the year, four times the total quantity produced in 1970. The Conjunto Petroquímico da Bahia (COPEB) started operations at a plant in Camacari, Bahia, to produce 250 tons per day of urea and 200 tons per day of anhydrous ammonia from natural gas. Ammonium sulfate totaling 8,386 tons was produced as a coke-oven byproduct at the Volta Redonda plant of CSN.

Three areas—Araxá, Juqia, and Jacupiranga—supply phosphate at present to the domestic market. Although easy to exploit, the mines at Araxá and Juqia have a high iron content, while Jacupiranga has a low P_2O_5 content. Production of natural phosphates from the above areas reached 220,000 tons as compared with 174,000 tons in 1970.

No potash is produced in Brazil, and as a result, imports of manufactured potassic fertilizer materials exceeded 500,000 tons in 1970. It is anticipated that this situation will change with the development of large deposits of potassium containing evaporites discovered during oil exploration drilling in 1965. The Departamento Nacional da Produção Mineral (DNPM) explored the deposits, and in May of 1971, CPRM announced the opening for public bid of the results of the DNPM studies. According to the CPRM announcement, the exploration resulted in the defining of reserves of 450 million metric tons of sylvinite (a mixture of sylvite and halite), 6,060 million tons of carnallite (hydrous magnesium-potassium chloride), 4,000 million tons of tachyhydrite (hydrous calcium-magnesium chloride), 525 million tons of halite, and 10 million tons of bromine in the tachyhydrite.

A prequalification bid was to be submitted by interested parties not later than August 2, and the final bid by those who qualified was to be submitted to the CPRM by November 30. The final bid was to be in the form of an offer for acquisition and the rights to develop the deposits. A fixed base price of $1.45 million was established by CPRM. A variable over and above this fixed base price was to be the prime factor in awarding the contract. The production of potash is to begin under the contract by January 1, 1975, when the mines will be equipped for a minimum annual production of 500,000 metric tons; from this date on, the annual production shall be not less than 250,000 metric tons. Selection of the winning bid had not been announced at yearend.

Graphite.—Practically all Brazilian graphite comes from one mine, at Itapecerica, Minas Gerais, operated by Cia. Nacional de Grafita, Ltda. During the year, this operation produced 23,709 tons of crystalline graphite ore averaging 18.0 percent carbon. Output of beneficiated graphite totaled 2,733 tons with a variable carbon content of 70 to 99.9 percent. The company estimates that it will increase production in 1972 by at least 20 percent.

Sodium Compounds.—Brazilian salt essentially all comes from solar evaporation, and during the year output totaled 1.48 million tons, of which 62 percent was from Rio Grande do Norte and 24 percent from the State of Rio de Janeiro. Production was 19 percent less than in 1970 but consumption exceeded output slightly and thus helped to lower previous stock buildup.

Salt continues to play an ever-increasing role as a raw material for the manufacture of industrial chemicals, chiefly caustic soda and chlorine. Early in 1971, the du Pont de Nemours group announced that it would participate to the extent of 45 percent of the capital of a new company, Salgema Industries Químicas, S.A., which will own and operate a plant to produce 250,000 tons per year of caustic soda and 220,000 tons per year of chlorine. Provision will be made for expansion of these initial capacities to 500,000 tons per year of caustic soda and 440,000 tons per year of chlorine. Other shareholders are a Brazilian industrialist (45 percent) and the Brazilian National Bank for Economic Development (10 percent). The plant will be sited near large rock salt deposits at Maceio, Alagoas, in northeast Brazil. Construction of the plant was to begin late in the year and was scheduled for completion late in 1974.

Sodium carbonate, caustic soda, and commercial salt are also produced by the Cia. Nacional de Alcalis from salt brines at its large plant at Cabo Frio, Rio de Janeiro. The Minister of Industry and Commerce early in 1971 approved an expansion plan to increase the plant capacity to 200,000 tons.

Sulfur.—Brazil continued to be in short supply of sulfur as none of the planned sulfur recovery units under construction by PETROBRÁS at Duque de Caxias, Betim, and Canoas refineries were completed. The Indústria Brasilera de Enxofre, S.A., recovered sulfur from "sour" refinery gas at its plant adjacent to the Capuava refinery of União, S.A., near São Paulo. About 9,200 tons of sulfur was recovered in this manner during the year.

MINERAL FUELS

Coal.—Coal output increased slightly in Santa Catarina, the principal producing State, but decreased in both Paraná and Rio Grande do Sul. As a result, run-of-mine coal output advanced 9 percent, but washed coal output was only 5 percent more than in 1970. Necessary preparation of Brazilian coal, particularly from Santa Catarina, results in a high loss factor, and in 1971, only 44 percent of the total coal mined was usable. Data on production and consumption of coal by industry during 1970 and 1971 follows, in thousand metric tons:

State	Production			
	1970		1971 [p]	
	Run-of-mine	Washed	Run-of-mine	Washed
Paraná	373	230	346	198
Rio Grande do Sul	965	857	948	856
Santa Catarina	3,845	1,280	4,353	1,437
Total	5,183	2,367	5,647	2,491

Industry	Consumption					
	1970			1971 [p]		
	Domestic	Imported	Total	Domestic	Imported	Total
Iron and steel	716	1,519	2,235	833	1,653	2,486
Thermoelectric power	1,527	--	1,527	1,530	--	1,530
Manufactured gas	31	207	238	30	195	225
Railroads	33	--	33	32	--	32
Miscellaneous	4	2	6	5	2	7
Total	2,311	1,728	4,039	2,430	1,850	4,280

[p] Preliminary.

In view of the current expansion plans of Brazil's three largest State-owned steel companies—USIMINAS, CSN, and COSIPA—it has been estimated that the country's imported coking coal needs will rise from the current 1.5 to 1.7 million tons per year to at least 3.7 million tons by 1975, by which time raw steel output is expected to be 13 million tons per year. The United States has been the main source of supply in recent years, and during the first 10 months of 1971, the United States supplied 1.4 million tons. However, it is understood that the three companies are now looking to Australia and Poland for future supplies. COSIPA has been testing coal from the Newcastle area of New South Wales while the other two companies have been showing interest in supplies from various mines in New South Wales and Queensland.

Petroleum and Natural Gas.—Production of 62.0 million barrels of crude petroleum in 1971 was 3.4 percent above the output in 1970 but still slightly below the record 63 million barrels produced in 1969. The increased production resulted from application of secondary recovery methods, principally gas injection, in the Recôncavo Basin of Bahia to counterbalance the natural decrease in pressure in the fields and to maintain production levels and recoverable reserves. PETROBRÁS estimates that 421 million barrels of petroleum can be obtained by such secondary recovery techniques.

Output of natural gas decreased 6.9 percent but production of natural gas liquids (NGL) increased 44 percent above 1970 production as a result of the inauguration of a second natural gasoline plant located in Candeias. The new plant, which can process about 71 million cubic feet of gas per day, receives input from the fields of Candeias, Taquipe, and Agua Grande in Bahia. The wet gas is treated to separate the NGL and then is piped to the Mataripe refinery where gasoline and liquefied petroleum gas (LPG) fractions are removed. The dry gas remaining is returned to the producing fields for reinjection or industrial uses.

During the year, PETROBRÁS operated five refineries with a combined nominal operating capacity of 482,000 barrels per day of crude input. In addition, the six privately owned Brazilian refineries continued to operate throughout the year, except for Riograndense which ran for only half the year, at near the legally allowed limit of 58,700 barrels per day. According to the National Petroleum Council, 193.7 million barrels of crude petroleum was processed during the year by all refineries, national and private, which reflects essentially 100 percent utilization of installed capacity.

During the year, construction of the new 126,000-barrel-per-day Planalto refinery near Campinas, São Paulo, continued to near completion. Expansion at the Cubatão and the Duque de Caxias refineries, each by

45,000 barrels per day, was practically completed. At the Duque de Caxias plant, the work involved a new lubricant unit and a catalytic cracking unit. The Mataripe refinery also was undergoing expansion relative to production of lubricants and paraffins, catalytic cracking, and the tank farm. At the Betim and Canoas refineries, construction was initiated on sulfur removal and recovery units.

The volume of refined products, mainly regular gasoline, residual fuel oil, and diesel fuel, in that order, increased in 1971. Although a large variety of items continued to come from Brazil's refineries, certain items, primarily lubricating oils and LPG, but also fuel oil, diesel oil, and aviation gasoline, were imported. The value of such imports during the year reached $72 million c.i.f. In addition to the imports of refined products, crude oil imported during the year was equivalent to 153.4 million barrels, of which 1.3 million barrels was reexported to Argentina. The c.i.f. value of petroleum imported for consumption was $403.4 million, corresponding to an average price of $2.65 per barrel. This marked a 26-percent increase over the 1970 average price per barrel, caused by higher prices for crude posted by the producing countries, primarily those in the Persian Gulf area. PETROBRÁS in 1971 continued to a greater degree than heretofore a maneuver for what amounted to an exchange of national for imported crude under advantageous price conditions. The background reason for this procedure was PETROBRÁS' ability to refine lower priced high-sulfur crude and thereby being able to recover sulfur, a commodity which Brazil lacks. In return, it was possible for Brazil to furnish higher priced low-sulfur crude for refining to areas in which such refinery input stock is required because of pollution problems. On this basis, PETROBRÁS exported 4.3 million barrels of Sergipean crude valued at $15 million.

Geologic and geophysical exploration and exploratory, development, and injection drilling activities, all of which were performed by PETROBRÁS or its contractors, were as follows:

		1970	1971
Geologic and geophysical exploration:			
Surface geology	party months	72	60
Seismic surveying	do	r 74	82
Magnetic surveying	do	6	--
Photogeology	do	24	--
Total	do	r 176	142
Drilling:			
Wells drilled:			
Exploratory:			
Oil	number	28	13
Gas	do	5	6
Dry	do	79	68
Subtotal	do	112	87
Development:			
Oil	do	62	54
Gas	do	--	1
Dry	do	15	29
Subtotal	do	77	84
Injection	do	22	--
Total	do	211	171
Footage drilled	thousand feet	r 709	722

r Revised.

PETROBRÁS continued to give a high priority to exploration in 1971, which was more or less equally divided between the Continental Shelf and land basins. Among the successful results during the year were the discovery of the Caioba and Camorim areas off the coast of Sergipe, North Miranga and Remanso in the Recôncavo Basin, and Tigre in Sergipe. Caioba is currently producing, but Camorim is still waiting for the interpretation of seismic work done in the shallow water of the area. North Miranga has been delineated as promising, and in Remanso a pioneer well was completed and considered a gas producer. Tigre is classed as a potential oil area on the basis of discovery in a pioneer well. Seismic crews operated on the Continental Shelf, primarily in deep-water areas, and on land in priority areas of Recôncavo, Sergipe-Alagoas, Tucano, Espírito Santo, and Barreirinhas. Geophysical work and exploratory drilling was restarted in the Amazonas and Paraná Paleozoic Basins. Geologic mapping was mainly confined to photogeologic interpretation of the results of side-looking radar mapping of 60,000 square kilometers in the Maranhão Basin and 150,000 square kilometers in Acre. As of early 1972, PETROBRÁS had in operation for exploration and development an estimated 26 drilling rigs. This total included five offshore jackup rigs, two tender rigs, and two drill ships, and 17 PETROBRÁS land rigs.

The PETROBRÁS tanker fleet (FRON-

APE) in total remained unchanged at 32 tankers totaling 820,000 gross tons. However, during the year, there were ordered three mixed-cargo type (ore-petroleum) ships of 131,000 gross tons each to be constructed in Brazilian yards. In addition, there were ordered five tankers of 115,000 gross tons each, three from national and two from Japanese yards. Construction was begun on two tankers of 26,400 tons each, part of a group of four tankers contracted for at national yards; two tankers contracted for at Japanese yards were ordered increased in tonnage from 35,000 to 53,000 tons. At the end of the present construction program, FRONAPE will have a total capacity of 2.2 million gross tons. The FRONAPE fleet plus chartered ships transported 28.2 million tons of crude oil during the year, not including coastwise movement in much smaller ships. The 234-kilometer pipeline from São Sebastião to Paulinia refinery was completed and delivered the first crude to Paulinia in October. The total movement of petroleum and derivatives through ocean terminals and pipelines of PETROBRÁS reached 283 million barrels during the year, 9.7 percent more than in 1970.

Privately owned companies continued to distribute the greatest proportion of petroleum derivatives produced in the country. However, PETROBRÁS' efforts in obtaining a larger share of this profitable and competitive market has resulted in a marked growth of this federally owned company into this field. During the year, a subsidiary company, Petrobrás Distribuidora, S.A., was set up to handle this segment of the business with a capital of approximately $25 million. The network of service stations throughout Brazil was increased from 527 at the end of 1970 to over 900. As a distributor, PETROBRÁS ranks third with about 22 percent of the market.

No shale oil was produced commercially in 1971. PETROBRÁS, still the only company actively engaged in oil shale development, completed construction of its prototype unit at São Mateus do Sul, Paraná. However, the first barrel of oil from shale was not produced until mid-1972. PETROBRÁS has stated that the semiindustrial-size unit will eventually process 2,200 tons of shale per day to yield 1,006 barrels of oil, 1,290,000 cubic feet of combustible gas, and 17 tons of sulfur.

The Mineral Industry of Bulgaria

By Bernadette Michalski[1]

The Bulgarian mineral industry remains of modest significance in terms of total world mineral production contributing about 4 percent of the total world lead output, 2 percent of the zinc output and about 1 percent of the copper output. The industry is, however, of considerable significance when related to the domestic economy. Nearly $3.34 billion[2] of the $14.2 billion total capital investment allotment for 1971–75 will be spent on new construction and modernization of existing facilities in the mineral and metal industries. The bulk of the investment was directed toward new construction but at least 35 percent of the $3.34 billion was reserved for reconstruction and modernization of existing obsolescent production facilities. On January 1, 1971, several new economic acts went into effect to implement the economic policy outlined by the Bulgarian Communist Party. The major purposes of these acts were to tighten centralized direction of the economy and to shift the base of the Bulgarian industrial economy to large-scale industrial units. The economic results for 1971 were, however, disappointing. Production of iron and steel, cement, and nitrogenous fertilizers fell below expectation. The most commonly sighted cause was the untimely arrival of imported raw materials causing frequent downtime on production lines. Apparently the January economic acts tightening centralized control had not yet been effective.

The program basing the economy on larger scale industrial units will be implemented through construction and design assistance by the U.S.S.R. Virtually the entire construction and modernization program in the 1971–75 period is under design and construction by the U.S.S.R.

The bulk of Bulgaria's mineral and metal industry is based upon imported raw materials from the U.S.S.R. and other Communist nations of East Europe. More than half of the nation's energy demands were imported in 1971, nearly all from the U.S.S.R. and East Europe. By the end of 1975 Bulgaria will be more dependent upon fuel imports. Crude oil shipments from the U.S.S.R. at that time are planned at 200,000 barrels per day to supply a large part of expanded refinery capacity at Pleven and Burgas.

Natural gas shipments from the U.S.S.R. (at over 100 billion cubic feet per year) together with increased solid fuel imports from U.S.S.R., Poland, and Czechoslovakia, and increased iron ore and manganese ore imports from the U.S.S.R. are programed to support expanded iron and steel output at the Kremikovtsi and the Lenin iron and steel combines. Imported U.S.S.R. natural gas will also serve as raw material for chemical fertilizers and electric energy generation. The U.S.S.R. will also be the source of nuclear fuel for Bulgaria's nuclear reactor now under construction.

PRODUCTION

Bulgaria's 1971 mineral output data are incomplete. For most major commodities, figures were available for only the first 9 months of the year.

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[1] Foreign mineral specialist, Division of Fossil Fuels.

[2] Where necessary values have been converted from Bulgarian levas to U.S. dollars at the rate of 1 leva=US$0.9345.

Table 1.—Bulgaria: Production of mineral commodities

(Thousand metric tons unless otherwise specified)

Commodity [1]	1969	1970	1971 [p]
METALS			
Cadmium smelter output [e] ____ metric tons__	200	200	200
Copper:			
Mine output, metal content ____ do____	39,300	43,100	44,400
Blister including secondary ____ do____	38,000	43,700	42,000
Refined electrolytic including secondary ____ do____	36,300	38,300	40,800
Iron and steel:			
Iron ore and concentrate	2,688	2,409	3,001
Pig iron including blast furnace ferroalloys	1,134	1,251	1,341
Crude steel	1,515	1,800	1,947
Semimanufactures	1,287	1,533	[e] 1,900
Lead:			
Mine output, metal content ____ metric tons__	91,200	95,500	[e] 100,000
Smelter including secondary ____ do____	95,100	98,600	[e] 100,000
Manganese ore, gross weight	39	33	[e] 30
Molybdenum mine output, metal content [e] ____ metric tons__	[r] 100	120	140
Zinc:			
Mine output, metal content ____ do____	77,000	76,400	[e] 70,000
Smelter including secondary ____ do____	75,800	76,100	[e] 76,000
NONMETALS			
Asbestos ____ do____	2,800	3,000	[e] 3,000
Cement, hydraulic	3,552	3,668	3,880
Clays, kaolin	122	127	[e] 130
Fertilizer materials, manufactured:			
Nitrogenous:			
Gross weight	1,385	1,523	NA
Nitrogen content	541	589	NA
Phosphatic:			
Gross weight	394	409	NA
Phosphorus pentoxide content	140	142	NA
Gypsum and anhydrite:			
Crude	170	169	[e] 170
Calcined	20	20	[e] 20
Lime (quicklime)	909	940	[e] 950
Pyrite:			
Gross weight	[r] 161	156	[e] 150
Sulfur content	67	66	[e] 64
Salt, all types	[r] 126	135	[e] 140
Sulfur, elemental, recovered ____ metric tons__	5,320	5,463	[e] 5,500
MINERAL FUELS AND RELATED MATERIALS			
Coal (marketable):			
Anthracite	155	161	389
Bituminous	215	236	
Lignite and brown	28,632	28,854	26,601
Total	29,002	29,251	26,990
Natural gas, marketed production ____ million cubic feet__	18,537	16,723	[e] 15,300
Petroleum:			
Crude oil:			
As reported	325	334	305
Converted [e] ____ thousand 42-gallon barrels__	2,373	2,438	2,227
Refinery products:			
Gasoline ____ do____	7,353	9,800	NA
Kerosine ____ do____	969	976	NA
Distillate fuel oil ____ do____	10,526	13,240	NA
Residual fuel oil ____ do____	14,945	17,424	NA
Lubricants ____ do____	280	368	NA
Asphalt, including natural ____ do____	570	742	NA
Total ____ do____	34,643	42,550	[e] 53,000

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, bismuth, chromite, gold, silver, barite, fluorspar, magnesite, palladium, platinum and tellurium are also produced, but information is inadequare to make reliable estimates of output levels.

TRADE

The U.S.S.R. is by far Bulgaria's leading trade partner, accounting for at least 60 percent of Bulgaria's total trade and an estimated 80 percent of total mineral trade. Mineral and metal exports from the U.S.S.R. to Bulgaria were valued at $356.7 million[3] in 1970. Crude oil and refined petroleum product deliveries accounted for nearly a third of the Soviet exports to Bulgaria or $114.06 million as compared with $112.3 million in 1969. Bulgaria's imports of Soviet refined petroleum products will decline in favor of expanded crude oil imports as domestic refining capacity is expanded at Pleven and Burgas. Bulgarian mineral and metal imports by the U.S.S.R. were valued at $13.6 million in 1970 compared with $17.9 million in 1969. The decline in value resulting from decreased Soviet imports of rolled ferrous metals.

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[3] Where necessary, values have been converted from U.S.S.R. rubles to U.S. dollars at the rate of 1 ruble=US$1.11; however, values are probably derived by negotiated agreement between U.S.S.R. and Bulgaria, resulting in the above figures being more representative of a general range than of actual world market price value for the mineral commodities.

Table 2.—Bulgaria: Exports of selected mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum and alloys:			
Scrap	200	193	Netherlands 87; Italy 54; West Germany 52.
Unwrought and semimanufactures	5,938	8,115	Yugoslavia 5,456; West Germany 1,490; Italy 853; France 316.
Cadmium metal, all forms	88	102	West Germany 54; Belgium-Luxembourg 43; France 5.
Copper and alloys:			
Scrap	--	120	West Germany 49; Netherlands 39; Belgium-Luxembourg 16; Italy 16.
Unwrought and semimanufactures	3,713	6,156	Yugoslavia 3,300; West Germany 2,665; Italy 191.
Iron and steel:			
Scrap	9,240	5,297	Italy 5,229; West Germany 68.
Pig iron [2]	14,100	40,600	Turkey 5,000.
Ferroalloys	6,703	18,061	Italy 9,375; Poland 6,671; Belgium-Luxembourg 2,015.
Steel, primary forms thousand tons	62	56	Lebanon 23; India 10; West Germany 6; United Kingdom 6.
Semimanufactures:			
Bars, rods, and sections do	r 115	173	U.S.S.R. 56; Yugoslavia 44; Romania 28.
Plates and sheets do	383	355	Italy 64; Greece 54; Romania 47; France 41; Yugoslavia 31.
Hoop and strip do	(3)	2	All to France.
Wire do	r 4	6	Iran 4; Algeria 1.
Pipes and tubes do	r 29	62	Yugoslavia 24; Romania 13; U.S.S.R. 9; Poland 8.
Total do	r 592	598	
Lead:			
Oxides	744	704	Italy 654; West Germany 50.
Metal and alloys:			
Scrap	900	--	
Unwrought and semimanufactures [2]	28,569	22,188	Italy 6,648; U.S.S.R. 5,918; Austria 4,202; Switzerland 2,527.
Nickel and alloys, unwrought (including matte) and semimanufactures	142	7	All to Italy.
Silver and alloys, unworked and partly worked value, thousands	$2,898	$1,783	All to West Germany.
Titanium oxides	158	--	
Zinc:			
Oxides	138	60	All to Italy.
Metal and alloys, unwrought and semimanufactures [2]	50,006	48,503	United Kingdom 17,953; Italy 5,208; France 5,049; Czechoslovakia 3,962.
Other:			
Metal bearing slag, ash and dross	260	15	All to West Germany.
Metals and alloys, all forms	r 25	--	
NONMETALS			
Asbestos	3,732	4,665	All to Poland.
Barite	25,600	20,200	All to U.S.S.R.
Boron compounds, acid and oxide	329	--	
Cement [2] thousand tons	207	153	Yugoslavia 81.
Clays and products:			
Crude clay, kaolin	1,335	12,715	Italy 8,620; Poland 2,387; West Germany 1,200; Yugoslavia 508.
Products, nonrefractory	5,652	NA	
Fertilizer materials:			
Crude, phosphatic	3,300	--	
Manufactured, nitrogenous [2]	69,635	106,449	Greece 23,316.
Fluorspar	98	100	All to Yugoslavia.
Salt	--	21	All to Italy.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	1,738	NA	
Soda ash	25,600	23,100	All to U.S.S.R.
Stone, dimension	5,302	3,614	West Germany 2,832; Poland 691; Belgium-Luxembourg 91.

See footnotes at end of table.

Table 2.—Bulgaria: Exports of selected mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
NONMETALS—Continued			
Sulfur, sulfuric acid [2]	[r] 64,442	10,340	Romania 9,989.
Talc	45,700	48,700	All to U.S.S.R.
Other, crude	1,254	1,071	All to West Germany.
MINERAL FUELS AND RELATED MATERIALS			
Petroleum:			
Crude oil thousand 42-gallon barrels	278	--	
Refinery products: [2]			
Distillate fuel oil do	159	606	Switzerland 308; Austria 184; Albania 30.
Residual fuel oil do	766	275	Greece 84; Italy 2.
Lubricants do	19	--	
Crude chemicals from distillation of coal, gas or oil	4,318	NA	

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[r] Revised. NA Not available.

[1] Compiled from official export statistics of Bulgaria and from import data of selected trading partners.

[2] Data from official Bulgarian export statistics.

[3] Revised to zero.

Sources: Official trade returns of Bulgaria, Poland, U.S.S.R. and Yugoslavia; United Nations, Statistical Office, Supplement to the World Trade Annual, 1969 ed., v. 1, 1971; United Nations, Economic Commission for Europe, Statistics of World Trade in Steel, 1969 and 1970 ed., 1970 and 1971; and European Community, Statistical Office, Analytic Tables NIMEXE, Luxembourg, 1971.

Table 3.—Bulgaria: Imports of selected mineral products [1]

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum:			
Bauxite	821	404	All from Yugoslavia.
Oxide	735	644	Netherlands 280; Italy 200; France 85; West Germany 79.
Metal and alloys, unwrought and semimanufactures [2]	28,161	26,749	U.S.S.R. 22,695; Austria 2,217; Hungary 667.
Antimony	1,225	863	All from U.S.S.R.
Chromium, chromite	3,400	NA	
Copper including alloys, unwrought and semimanufactures	8,262	5,087	U.S.S.R. 4,122; Yugoslavia 432; France 314.
Iron and steel:			
Iron ore [2] thousand tons	1,020	1,133	U.S.S.R. 1,033.
Pig iron do	[2] 307	295	U.S.S.R. 212 [2]; Poland 21.
Ferroalloys do	13	21	U.S.S.R. 17; Poland 2.
Steel, primary forms do	27	10	Mainly from Romania.
Semimanufactures: [3]			
Bars, rods and profiles do	399	465	U.S.S.R. 405; Czechoslovakia 24; Romania 13.
Plates and sheets do	273	324	U.S.S.R. 214; Italy 30; Poland 19; Japan 15.
Hoop and strip do	11	25	West Germany 7; Czechoslovakia 4; Hungary 4.
Railway materials do	46	58	U.S.S.R. 40; Yugoslavia 8; Poland 5.
Wire do	127	16	U.S.S.R. 9.
Pipes, tubes and fittings do	79	81	U.S.S.R. 53; West Germany 8.
Unspecified rolled do	35	--	
Castings and forgings do	4	6	Poland 5; Yugoslavia 1.
Total do	974	975	
Lead ore and concentrate	11,708	NA	
Manganese:			
Ore and concentrate	98,345	80,000	All from U.S.S.R.
Oxide	80	90	All from Japan.
Mercury 76-pound flasks	319	696	All from Italy.
Nickel and alloys, unwrought and semimanufactures	262	124	All from West Germany.
Platinum-group value, thousands	$81	$38	West Germany $31; Belgium-Luxembourg $7.
Tin:			
Oxides long tons	14	16	West Germany 9; Belgium-Luxembourg 7.
Metal and alloys, unwrought and semimanufactures do	168	NA	
Titanium oxides	1,368	1,359	Italy 1,113; West Germany 246.
Zinc ore and concentrate	37,750	22,147	All from Yugoslavia.

See footnotes at end of table.

Table 3.—Bulgaria: Imports of selected mineral products [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS—Continued			
Other and unspecified:			
Ore and concentrates	139	--	
Metal and alloys, unwrought and semimanufactures	1,373	--	
NONMETALS			
Asbestos	24,600	21,200	All from U.S.S.R.
Barite and witherite	3,050	NA	
Borates, crude	5,200	NA	
Cement thousand tons	113	94	U.S.S.R. 92; Poland 2.
Clay products, refractory	22,143	23,826	U.S.S.R. 23,400; Yugoslavia 356; Poland 70.
Diamond industrial value, thousands	$60	$213	Belgium-Luxembourg $142; West Germany $71.
Feldspar	675	625	Yugoslavia 325; West Germany 300.
Fertilizer materials: [4]			
Crude:			
Phosphatic (apatite concentrates)	345,300	341,300	All from U.S.S.R.
Potassic (salts)	r 51,800	38,300	Do.
Manufactured:			
Phosphatic	183,070	213,428	U.S.S.R. 180,300; Yugoslavia 33,128.
Mixed	12,924	NA	
Fluorspar	100	145	All from West Germany.
Graphite	1,100	--	
Magnesite	193	NA	
Pigments, mineral, iron oxide	172	108	West Germany 83; France 25.
Salt	12,009	NA	
Sulfur	27,787	11,100	All from U.S.S.R.
Other crude nonmetals	--	202	Netherlands 132; West Germany 70.
MINERAL FUELS AND RELATED MATERIALS			
Carbon, black [2]	9,860	13,286	U.S.S.R. 7,133; Italy 3,610; East Germany 1,525.
Coal, all grades thousand tons	4,088	5,065	All from U.S.S.R.
Coke [2] do	196	465	U.S.S.R. 138; Czechoslovakia 50; Poland 47.
Petroleum:			
Crude oil thousand 42-gallon barrels	35,331	41,858	U.S.S.R. 34,979.
Refinery products:			
Gasoline do	2,958	2,270	U.S.S.R. 1,870.
Distillate fuel oil do	4,028	3,820	U.S.S.R. 3,193.
Residual fuel oil do	11,002	11,775	U.S.S.R. 10,343.
Lubricants do	616	610	U.S.S.R. 498.
Crude chemicals from distillation of coal, gas or oil	r 14,163	13,974	All from U.S.S.R.

r Revised. NA Not available.

[1] Compiled from official import statistics of Bulgaria and from export data of selected trading partner countries.

[2] Data from official Bulgarian import statistics.

[3] Official import statistics report the receipt of only 523,000 tons in 1969 and 457,000 tons in 1970, but these represent receipts of only a select few categories of semimanufactures. Because of the incomplete nature of these data, export statistics of trading partner countries have been used for the entire steel semimanufacture section. Figures for 1969 exclude exports from Czechoslovakia, East Germany, and Hungary to Bulgaria; figures for 1970 include exports from these countries. Total 1969 imports from these countries as reported in Bulgarian sources were 22,000 tons.

[4] Official import statistics report the receipt of 1,063,000 tons of all types of fertilizers in 1969 and 866,000 tons in 1970, quantities which considerably exceed the totals for the commodities listed below, which are derived from trading partner export statistics. However, official import statistics do not break down the total by type. Among the source countries listed in official import statistics, but not covered by trading-partner export data was Tunisia, which reportedly supplied 305,000 tons in 1969 and 121,000 tons in 1970, all of which was presumably phosphate rock.

Sources: Official Trade returns of Bulgaria, Poland, Yugoslavia and the U.S.S.R. for 1969 and 1970; United Nations, Statistical Office, Supplement to the World Trade Annual, 1969 ed., v. 1, 1971; United Nations, Economic Commission for Europe, Statistics of World Trade in Steel, 1970 ed., 1971; European Community, Statistical Office, Analytical Tables NIMEXE, 1969 and 1970 ed., Luxembourg, 1970 and 1971.

COMMODITY REVIEW

METALS

Copper.—Increases in copper mine and smelter production resulted from expansion and modernization of the Medet porphyry deposit mine and mill facilities. By 1972, when the Medet mine and mill facilities attain planned capacity, copper metal production from Medet concentrates is planned at 34,000 tons.

Development work on the Chelopets deposit near Sofia was underway during the year. By 1975 the mine should operate at annual capacity level of 500,000 tons of ore containing 0.5 to 1.5 percent copper.

At least half of Bulgaria's copper output is processed into copper profiles, sheet, and wire at the Dimiter Ganev plant in Sofia. The plant is undergoing expansion and by 1973 should have the capacity to produce 110,000 tons of nonferrous semimanufactures annually. With the Dimiter Ganev plant operating at full capacity Bulgarian exports of nonferrous ingots will be replaced by export of nonferrous shapes, thin sheet and pipes.

Iron and Steel.—The value of Bulgaria's production of nearly 2 million tons of crude steel represented an estimated 3.5 percent of the nation's gross national product in 1971. Output was derived from two plants, the Kremikovtsi Iron and Steel plant near Sofia and the Lenin Iron and Steel Plant at Pernik. Both plants were under expansion during the year to support a production goal of 2.8 million tons of crude steel with sufficient downline processing capacity by 1975.

By yearend, construction was underway on the first of Bulgaria's two iron foundries which are to become operational during the current 5-year plan. Both foundries will be located near Sofia. Their capacities are planned at 50,000 and 70,000 tons by 1975.

Lead and Zinc.—Ore production in 1971 was estimated at 15 million tons with metal content estimated at 170,000 tons. A new lead mine is under development at Yerma Reka in the Rhodope Mountains. While no description of the deposit is available, Bulgarian reports claim it will satisfy the nation's needs "for decades."

NONMETALS

Development activities in nonmetallic minerals were focused on cement and mineral fertilizer production. Additional facilities were under construction and old facilities were being modernized to raise cement output to 6 million tons and mineral fertilizer output to 1.2 million tons by 1975, the close of the current 5-year plan. The newly commissioned Zlatna Panega cement plant at Lukovit reportedly became operational during the year. Plant operating capacity is proposed at 1.6 million tons annually by 1975. This plant is the first Bulgarian cement facility to utilize fluorescent rayon-x analysis. By yearend the Wilhelm Peck de Beli Izvor plant near Vratsa was reportedly expanded to a 1.4-million-ton capacity, probably a 30-percent increase over its former capacity. During the year, construction was undertaken on a 1.2-million-ton-per-year cement plant located in Southern Bulgaria. Supplemental information on the plant was not reported.

Construction and expansion activity in mineral fertilizer production was centered at the Varna and Vratsa fertilizer plants. Increasing amounts of imported natural gas and phosphate rock will serve as raw materials for the complex.

MINERAL FUELS

Energy consumption in 1971 was estimated at 30 million tons of standard coal equivalent (SCE). About half of this requirement was supplied from domestic sources, principally lignite and brown coal. The solid fuel contribution to Bulgaria's energy supply is, however, rapidly diminishing. Solid fuels from both domestic and foreign sources contributed an estimated 53 percent of total energy consumption in 1971 declining from its 1965 contribution level of 76 percent. Liquid fuels derived principally from imported crudes accounted for an estimated 43 percent of total energy consumption in 1971, considerably higher than its 24-percent share of 1965 total energy consumption. The remaining 1971 energy consumption requirements were supplied by natural gas at 3 percent and hydroelectric power at 1 percent. The contribution of natural gas to total energy consumption will appreciably increase in 1975 with the completion of the 106-billion-cubic-foot-per-year-capacity gas pipeline linking Soviet gasfields with Bulgaria's principal gas consuming centers. Bulgarian power stations generated 20 billion kilowatt hours of electricity in 1971. Nearly 90 percent of this output was derived from thermal power stations. By 1975 electric power production is planned to increase to 31 billion kilowatt hours. While thermal power stations will continue to generate the bulk of the nation's electricity, 2 to 5 billion kilowatt hours of nuclear generated electricity will enter the nation's power grid by 1975.

Construction continued at Kozludui, the site of Bulgaria's first nuclear powerplant. The first reactor of 400-megawatt capacity is scheduled for service in 1973 and a second 400-megawatt reactor should be in service by 1974. The design and construction of the powerplant as well as the supply of the nuclear fuel for the powerplant are under Soviet auspices. Construction continued on the 630-megawatt-capacity Bobov Dol thermal powerplant. Fueled by the Bobov Dol lignite deposit, the powerplant should be in operation by 1975. Completion of the Soviet-Bulgarian gas pipeline in 1975 will affect the Devnya, Sofia, Traycho Kostov, Pernik, and Kremikovtsi thermal power stations, which will then operate a dual fuel system of natural gas and fuel oil.

Coal.—Coal output was reduced to less than 27 million tons with low-quality lignite and brown coals constituting about 99 percent of the total production. While production declined in 1971, Bulgarian plans call for production increases to 33 million tons by 1975 when small and frequently marginal operations will have been abandoned in favor of larger, mechanized operations.

A third Soviet designed coking battery was commissioned at the Kremikovtsi Iron and Steel plant in March raising the nation's coking capacity to a level of self-sufficiency at 1.4 million tons per year.

Natural Gas.—Domestic natural gas production continued to yield disappointing results with output estimated at 15.3 million cubic meters in 1971. Production was principally derived from the Stara Orjahovo field on the Black Sea Coast and from Chiren (Tcherven) in Northwestern Bulgaria. While preliminary drafts of the 1971–75 5-year plan set domestic natural gas production at 35 billion cubic feet by 1975, gas production projection figures were conspicuously absent in succeeding reports, possibly indicating an even greater dependency on gas supplies from the Soviet Union. By yearend, Bulgarian reports indicated that construction of the 435-mile pipeline linking the Soviet Ukranian gas deposits with major Bulgarian industrial centers was ahead of schedule. Bulgaria's urgent requirements for natural gas may prompt completion of the 106-billion-cubic-foot-per-year-capacity pipeline before its scheduled completion date of 1975.

Petroleum.—Domestic crude oil continued to decline with output at 6,100 barrels per day in 1971. Crude runs at Bulgaria's two refineries were estimated at 152,000 barrels per day with the U.S.S.R. providing 130,000 barrels per day, Iraq 10,000 barrels per day, and the remaining 5,900 barrels per day of imported crude probably obtained from Iran, Syria, and/or the United Arab Republic.

Bulgaria's largest refinery and petrochemical complex is located at Burgas and operated near capacity level of 120,000 barrels per day. Construction of a products pipeline linking the refinery with major product consumption centers of Stara Zagora and Plovdiv was underway with completion of a 60-mile link between the refinery and Kariobat. The 40,000-barrel-per-day-capacity line will total 175 miles in length. It is scheduled to reach its completion point at Plovdiv by 1973.

Construction of a second refining unit at the Pleven Refinery and Petrochemical complex was completed in March increasing capacity from 20,000- to 40,000-barrels-per-day-crude throughput. Exception for the limited domestic production from the northwestern fields, Pleven refinery crude throughput is railed inland from Bulgaria's northern Black Sea ports. A pipeline network is under construction connecting the Northern Black Sea ports with the Pleven refinery; however, the lines will not be in full operation until 1975, at which time the projected capacity of the Pleven complex should attain 120,000 barrels per day.

To support expanded imports of foreign crude, Bulgaria has contracted for expansion of her tanker fleet from its present 18 ships with total capacity of 257,000 deadweight tons (d.w.t.) to a total fleet of 29 ships with total capacity of 850,000 d.w.t. by 1975.

Present Bulgarian Black Sea Port facilities are not adequate to accommodate expanded tanker service. Port extension facility studies were undertaken during the year. Two plans under consideration included the construction of an additional wharf to provide berths for two 150,000-d.w.t. tankers at Shabla and construction of a submerged pipeline in the open sea where 150,000-d.w.t. tankers can unload cargo while moored to a buoy. This latter facility is proposed for both the Kavarna and Burgas ports.

The Mineral Industry of Burma

By Donald C. Wininger [1]

Burma's "hard rock" part of the mineral industry showed only moderate improvement during 1971. Production from the Bawdwin mine near Lashio and the Chinese border increased, but the grade of the ore continued to decline. Production of tin and tungsten recorded a substantial increase in 1971, which indicated that the overall rehabilitation program was making significant progress, although output from the Mawchi tin-tungsten mine achieved only modest gains. In February a cooperative agreement was signed with the West German Government regarding general exploration for mineral resources in Burma.

An untied loan of $10 million [2] was negotiated with Japan to finance exploratory drilling for oil in the Gulf of Martaban. The drilling, scheduled to begin early in 1972, will be conducted by a U.S. contractor, which will be the first foreign firm to engage in drilling operations in Burma since nationalization of the oil industry in 1963. A loan was also received from the Export-Import Bank (Eximbank) to help finance the purchase of six more oil drilling rigs. The fertilizer plant being constructed by the West Germans to utilize local natural gas to make urea was nearing completion at yearend.

The mineral industry of Burma has become very much a government business. Various government corporations are assigned to manage the different mining sectors. In fiscal 1970–71,[3] the national budget showed the following estimated capital expenditures: Myanma Oil Corp. (MOC), $14.6 million; Myanma Bawdwin Corp. (MBC), $2.3 million; and Mineral Development Corp. (MDC), $4.6 million.

PRODUCTION

According to official Burmese national budget estimates,[4] "mineral" output totaled $43.3 million in fiscal year 1969–70 and $42.4 million in 1970–71. Crude oil and limestone are included, but not the value added derived from mineral and metal processing. Thus, products like salt, cement, refined oil, and processed metals are excluded either in total or in part. Reported output values for major minerals were as follows for 1970–71: Crude oil, $18.2 million; nonferrous output of the Bawdwin enterprise, $7.4 million; and tungsten concentrates, $4 million. In addition, the following values were reported for output of processed materials during 1970–71; salt, $3 million; cement, $4.1 million; refined petroleum $69.3 million; and iron and steel products, $15 million.

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[1] Physical scientist, Division of Nonmetallic Minerals.

[2] Where necessary, values have been converted from Burma Kyats (BKs) to U.S. dollars at the rate of BKs4.76=US$1.00. In the open market, the kyat is worth much less; actually, one dollar can buy 15 kyats or more.

[3] Burma's fiscal year runs from October to the following September.

[4] Report to the people by the Government of the Union of Burma on the financial, economic and social conditions for 1971–72. The revolutionary council of the Union of Burma.

Table 1.—Burma: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1969	1970	1971 [p]
METALS			
Antimony, mine output, metal content	[e] 60	65	128
Copper:			
Mine output, metal content [e]	70	70	70
Matte, gross weight	[r] 168	167	175
Iron and steel:			
Crude steel [e]	21,000	21,000	21,000
Semimanufactures [e]	25,000	25,000	25,000
Lead:			
Mine output, metal content	8,695	8,085	9,310
Smelter:			
Refined lead	9,720	9,512	9,481
Antimonial lead (18 to 20 percent antimony)	302	239	309
Nickel:			
Mine output, metal content	30	21	24
Speiss, gross weight	119	84	94
Silver, mine output ... thousand troy ounces	902	572	952
Tin, mine output:			
Metal content of tin ores ... long tons	212	175	396
Metal content of tin-tungsten ores ... do	161	252	284
Total ... do	373	427	680
Tungsten, mine output:			
Metal content of tungsten ores	55	44	164
Metal content of tin-tungsten ores	112	175	198
Total	167	219	362
Zinc, mine output, metal content	4,892	4,067	4,247
NONMETALS			
Barite	9,703	13,463	22,963
Cement, hydraulic ... thousand tons	183	156	176
Clays:			
Ball [2]	14,961	7,638	13,615
Bentonite [2]	254	1,027	329
Fire [2]	65	1,490	1,321
Industrial white [2]	912	587	1,524
Pottery	935	635	2,256
Feldspar [2]	353	812	695
Fluorspar	127	[e] 130	[e] 130
Graphite	102	78	152
Gypsum	[r] 3,499	5,334	12,193
Precious and semiprecious stones:			
Jadeite ... kilograms	3,758	14,952	17,546
Rubies and sapphires ... carats	6,750	10,881	18,000
Salt ... thousand tons	176	193	186
Sand:			
Glass sand, brown [2]	NA	NA	4,822
Glass sand, white [2]	NA	NA	2,279
Stone:			
Dolomite [2]	768	786	658
Limestone, crushed and broken ... thousand tons	572	604	609
Quartz [2]	NA	106	274
Talc and related materials, soapstone	152	213	215
MINERAL FUELS AND RELATED MATERIALS			
Coal	14,613	15,259	19,711
Gas, natural, gross production ... million cubic feet	2,900	[er] 2,500	1,628
Petroleum:			
Crude ... thousand 42-gallon barrels	[r] 6,050	6,388	6,652
Refinery products:			
Gasoline, aviation ... do	29	24	--
Gasoline, other ... do	1,457	1,476	1,415
Jet fuel ... do	200	167	243
Kerosine ... do	1,857	1,810	2,247
Distillate fuel oil ... do	[r] 1,706	1,667	2,227
Residual fuel oil ... do	1,014	929	1,610
Other ... do	192	366	679
Refinery fuel oil and losses ... do	402	328	NA
Total ... do	6,857	6,767	NA

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, Burma also produces sand and gravel, and other varieties of crude stone, but data are inadequate to make reliable estimates of output levels.

[2] Data are for years ending June 30 of that stated.

TRADE

Burma's overall foreign trade declined sharply, from $284 million in fiscal year 1969–70 to about $216 million in 1970–71. Although total exports at $118 million showed a significant increase, total imports declined $74 million to $98 million according to preliminary estimates. In fiscal 1969–70, Burma exported $5.29 million in base metals and ores and $1.32 million in silver. In fiscal 1970–71, base metal exports were slightly down, but silver exports increased to more than four times the total for the previous year.

Burma's imports of mineral and related products dropped from roughly $31 million in 1968–69 to $26 million in 1969–70, and possibly to only $17 million in 1970–71. The largest item was base metals and manufactures, which reached $20.9 million in 1969–70, but declined to possibly only $14 million in 1970–71. Fertilizer imports showed the greatest change, declining from $6 million in 1968–69 to less than $1 million in 1969–70, and according to preliminary estimates, nil in 1970–71. Construction of new fertilizer plants brought about the sharp decline.

Table 2.—Burma: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Antimony ore and concentrate	40	--	
Copper matte	--	220	All to West Germany.
Iron and steel semimanufactures	1	--	
Lead:			
Ore and concentrate	219	--	
Metal, unwrought:			
Refined	11,021	2,688	Hong Kong 2,438.
Antimonial	367	--	
Nickel matte and speiss	--	166	All to West Germany.
Silver, unwrought ... thousand troy ounces	2,599	1,057	United Kingdom 733; West Germany 323.
Tin ore and concentrate [1] ... long tons	652	456	Netherlands 213; Spain 211.
Tungsten:			
Straight tungsten concentrates	279	275	Netherlands 104; India 92.
Mixed tin-tungsten concentrates	97	51	All to Netherlands.
Zinc ore and concentrate	7,878	5,530	All to Japan.
NONMETALS			
Cement	3	--	
Gem stone other than diamond:			
Jade:			
Uncut ... thousand carats	64	80	All to Hong Kong.
Cut but not set ... do	125	23	Mainly to Hong Kong.
Rubies:			
Uncut ... do	40	1,238	Switzerland 1,030.
Cut but not set ... do	3	2	Hong Kong 1.
Sapphires:			
Uncut ... do	35	521	Switzerland 235; India 223.
Cut but not set ... do	7	9	Hong Kong 8.
Precious and semiprecious stones n.e.s.:			
Uncut ... do	--	99	Hong Kong 86.
Cut but not set ... do	151	2	All to Hong Kong.
MINERAL FUELS AND RELATED MATERIALS			
Anthracite and bituminous	6	--	
Petroleum refinery products:			
Gasoline ... 42-gallon barrels	1	--	
Kerosine ... do	15	([2])	NA.
Distillate fuel oil ... do	10,496	18,436	NA.
Residual fuel oil ... do	56,524	11,316	NA.
Lubricants ... do	44	33	NA.
Tar and pitch ... do	5	--	

NA Not available.

[1] See also under tungsten for mixed tin-tungsten concentrates.

[2] Less than ½ unit.

Table 3.—Burma: Imports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum:			
Oxide and hydroxide	6	5	United States 4.
Metal including alloys:			
Unwrought	564	634	Australia 431.
Semimanufactures	433	1,561	U.S.S.R. 1,343; Japan 95.
Antimony ore and concentrate	1	--	
Arsenic trioxide, pentoxide, acids	10	27	West Germany 17.
Copper:			
Copper sulfate	10	67	Japan 50.
Metal including alloys:			
Unwrought	83	263	United Kingdom 254.
Semimanufactures	558	335	United Kingdom 127; Japan 97.
Iron and steel:			
Ore and concentrate	1	--	
Metal:			
Pig iron including cast iron	3,977	2,571	West Germany 2,442.
Sponge iron, powder and shot	--	3	All from West Germany.
Ferroalloys	101	20	West Germany 19.
Steel, primary forms	8,424	13,484	U.S.S.R. 13,439.
Semimanufactures	57,795	60,522	India 23,764; Japan 14,583; Belgium-Luxembourg 9,033.
Lead:			
Oxide	--	1	All from United Kingdom.
Metal including alloys unwrought and semimanufactures	5	18	Japan 7; United Kingdom 5.
Manganese oxides	260	681	Japan 539; West Germany 130.
Mercury 76-pound flasks	357	2,290	West Germany 2,178.
Nickel metal including alloys, unwrought and semimanufactures	9	3	East Germany 2.
Platinum metals including alloys, all forms troy ounces	18	29	Mainly from United Kingdom.
Silver including alloys do	4,929	1,873	Japan 1,146.
Tin:			
Oxides long tons	3	(2)	NA.
Metal including alloys, unwrought and semimanufactures do	3	6	Japan 5.
Titanium oxides	99	204	United Kingdom 135; West Germany 66.
Tungsten including alloys, all forms	1	--	
Zinc:			
Oxide	76	42	West Germany 37.
Metal including alloys, all forms	237	602	North Korea 234; Belgium-Luxembourg 197.
Other:			
Ore and concentrate	--	24	Mainly from Hong Kong.
Oxides, hydroxides and peroxides of metals n.e.s	12	43	United Kingdom 42.
Metals including alloys, all forms:			
Alkali and alkaline earth	8	--	
Base metals including alloys, all forms n.e.s	36	(2)	NA.
NONMETALS			
Asbestos	1,121	1,465	Canada 828; Republic of South Africa 621.
Boric acid	19	37	United States 36.
Bromine	--	1	All from United Kingdom.
Cement	996	1,019	Italy 848.
Chalk	110	24	Belgium-Luxembourg 20.
Clays and products:			
Crude n.e.s.:			
Kaolin (china)	59	44	All from United Kingdom.
Other	41	103	Japan 40; West Germany 40.
Products:			
Refractory value, thousands	$274	$116	Japan $70; United Kingdom $17.
Nonrefractory do	$14	$26	Japan $22.
Diamond, industrial do	$4	--	
Fertilizer materials:			
Manufactured:			
Nitrogenous	10,697	1,250	West Germany 644; Netherlands 520.
Phosphatic	17,983	1,016	All from Australia.
Potassic	--	20	All from Netherlands.
Mixed	1,007	2,212	Japan 2,197.
Ammonia	228	56	West Germany 28; India 17.
Graphite, natural	113	96	Japan 94.
Iodine	2	6	Mainly from United Kingdom.
Mica, all forms	1	1	Do.
Precious and semiprecious stones, except diamond:			
Jade carats	1,184	902	Reimports.
Manufactured do	83,460	428,376	All from Belgium-Luxembourg.

See footnotes at end of table.

Table 3.—Burma: Imports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
NONMETALS—Continued			
Salt	73	3	All from United Kingdom.
Sodium and potassium compounds n.e.s.:			
Caustic soda	2,406	3,012	Poland 1,564; Netherlands 670.
Caustic potash, sodic and potassic peroxides	9	23	West Germany 18.
Stone, sand and gravel:			
Gravel and crushed rock	--	2	All from West Germany.
Quartz and quartzite	16	59	Belgium-Luxembourg 30.
Sulfur:			
Elemental	243	1,331	West Germany 1,318.
Sulfuric acid	117	12	United Kingdom 7.
Other nonmetals n.e.s.:			
Crude, other	251	213	India 208.
Oxides and hydroxides of magnesium	2	(2)	NA.
Building materials of asphalt, asbestos, and fiber cement, and unfired nonmetals n.e.s.	2	507	Japan 497.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	1	--	
Carbon black	160	250	Australia 109.
Coal and briquets:			
Anthracite and bituminous	153,854	206,829	All from India.
Lignite and lignite briquets	--	82	All from West Germany.
Hydrogen, rare and inert gases	25	5	All from Japan.
Petroleum:			
Crude thousand 42-gallon barrels	447	1,473	Malaysia 1,378.
Refinery products:			
Gasoline, aviation do	60	5	Mainly from Iran.
Kerosine and jet fuel 42-gallon barrels	263	1	All from United Kingdom.
Residual fuel oil do	62,913	10	United Kingdom 7.
Lubricants thousand 42-gallon barrels	118	126	Singapore 80; Malaysia 15; Japan 15.
Mineral jelly and wax 42-gallon barrels	1,338	527	West Germany 244.
Other:			
Nonlubricating oils n.e.s do	137,060	7,056	All from Japan.
Pitch do	36,700	53,713	Malaysia 26,210; Japan 16,520.
Pitch coke do	39	--	
Bitumen and other residues do	76,732	12	All from West Germany.
Bituminous mixtures n.e.s. do	25,125	48	Mainly from West Germany.
Mineral tar and other coal, petroleum, or gas derived crude chemicals	354	9	United Kingdom 7.

NA Not available.

[1] Imports for consumption only; does not include imports into bond by commodity.

[2] Less than ½ unit.

COMMODITY REVIEW

METALS

Antimony.—In recent years, until 1970, the only antimony produced in Burma had been a few hundred tons of antimonial lead annually, analyzing 18 to 20 percent antimony, by the lead smelter in Namtu. Early in 1970, small-scale extraction of antimony ore was resumed, due primarily to extremely high prices and Government assistance by MDC. In fact, an intensive search for antimony led to the discovery of various deposits. A sharp decline in antimony prices from the high level of early 1970 undoubtedly will affect future operations, but actual production in 1971 was substantially higher than in the previous year.

Copper.—The Japanese Ministry of International Trade and Industry (MITI) joined with Japanese copper smelters to study the Monywa copper deposit northwest of Mandalay. Reserves are estimated at 15 million tons that grade from 1.3 to 1.5 percent copper.[5]

About 175 tons of copper matte was produced as a byproduct of refined lead from the Bawdwin mine.

Iron and Steel.—The Ywama steel plant, which has an electric furnace and rolling mills, remained the country's only steel producer. Scrap iron for feeding the furnace came from domestic sources, but a shortage seemed imminent. The steel plant rated at 40,000 tons of products annually has been running at about half capacity. Bars and rods were the main products, followed by wire nails, galvanized iron, and barrel sheets. Plans have been made to build additional facilities for wire netting, roller extension, tubes, and sheets, although funds were not in sight. Burma also has plans to build an integrated steel industry, a project which is even more uncertain.

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[5] World Mining. Burma. V. 7, No. 8, July 1971, p. 42.

Lead, Zinc, Copper, Silver, and Nickel.—The Government-owned Bawdwin enterprise in Northern Shan State near the Burma Road, originally under the Burma Corporation, then the People's Bawdwin Industry (PBI), and now the MBC, continued to be Burma's sole significant producer of nonferrous metals. Bawdwin has been producing refined lead, zinc concentrate, and byproducts for decades. The zinc concentrate has been sold as such mostly to Japan; lead and other materials have been sent to nearby Namtu for smelting before marketing abroad, primarily to India as in the case of refined lead. As of yearend 1970, this mining complex, with more than 7,000 workers, was capable of producing each year approximately the following: Refined lead, 15,000 tons; zinc concentrate, 10,000 tons; silver 1 million ounces; antimonial lead, 300 tons; copper matte, 200 tons; and nickel speiss, 130 tons.

The decline of the historically famous Bawdwin mine is mainly attributed to depletion of high-grade reserves that have analyzed one-third combined base-metal content in the ore. The tenor of the extracted ore has dropped sharply, and the grade of concentrates produced apparently continues to decline. Overall output of lead concentrates increased considerably, reaching about 16,900 tons in 1971, compared with 14,700 tons in 1970. However, the old smelter, which has a large surplus capacity, reportedly produced only 9,480 metric tons of refined lead in 1971, slightly lower than 1970.

The small Bawsaing mine in the Taunggyi district, also under MBC, which controls all nonferrous base-metal operations in the country, was being expanded to produce about 1,000 tons per year each of sulfide lead ore, carbonate lead ore, and lead slag. Output, so far totaling only about 2,000 tons of ore per year, has been sent to Namtu for smelting.

The new Yadana Theingi mine in the Nawnghkio district, Northern Shan State, was being built up to produce over 40,000 tons of silver-lead-zinc ore annually. The plan is to construct a powerplant, a mill, and a 32-mile road from the mine to Ohnmathi on the Mandalay-Lashio highway.

Tin and Tungsten.—MDC continued to control most of the country's tin and tungsten mines, and Government policy calls for the eventual takeover of the remaining private mines as soon as their licenses expire. Concentrates were produced separately or in mixed form. Combined annual output of the two related minerals has ranged between 800 and 1,700 tons of concentrates during the last 5 years, much lower than pre-World War II levels. Although statistics are conflicting, Burma has been producing, in terms of metal content, approximately 300 to 600 tons of tin and 100 to 350 tons of tungsten per year. Most production has come from the Tavoy and Mergui districts in the Tenasserim Division near the Thai border. The Government helps the small miners with implements. It also buys concentrates at relatively low prices, an action which has brought about smuggling into Thailand. Large-scale dredging operations have virtually ceased.

In an effort to spur production, a 4-year technical assistance agreement was signed between MDC and the Soviet Union to rehabilitate the once-famous Mawchi tin-tungsten lode mine. The mine was reopened on March 27, 1970, and a Soviet team of five experts arrived 4 months later. The initial goal was to produce about 100 tons of mixed concentrates monthly—roughly twice the monthly levels late in 1970. This was not achieved for 1971 as a whole. Apparently production of tin concentrate and tungsten concentrate were increased considerably in 1971, which indicates that the overall rehabilitation program was making significant progress.

NONMETALS

Cement.—Burma's only cement plant at Thayetmyo is also a Government enterprise. With two wet-process rotary kilns, the plant is capable of producing about 180,000 tons per year.

The Industrial Development Corp., operators of the Thayetmyo plant, ordered a second plant from Japan near yearend 1970. Kawasaki Heavy Industries is to supply this 800-ton-per-day cement plant for about $8.5 million. The plant will be installed in the Kyangin area in the upper reaches of the Irrawaddy River in 1972.

Fertilizer Materials.—Difficulties in rice production influenced the Government to encourage the use of chemical fertilizers in Burma. During the 5 years prior to 1970, annual fertilizer consumption had risen to approximately 150,000 tons, all imported. In 1970 the first of two similar fertilizer plants was completed, signaling the eventual stoppage of large-scale imports of nitrogen fertilizers. Complex or mixed fertilizers, however, would still be imported.

Both plants are located near the Chauk oilfields in central Burma in order to utilize the natural gas there. The annual capacities of each plant, costing approximately $14 million each, will be 40,000 tons of ammonia and an associated 65,000 tons of urea. The first plant, located at Pagan 20 kilometers north of Chauk, was built by the Japanese firm Hitachi Zosen. The second plant, near Sale at Kyunchaung 30 kilometers south of Chauk, is being built by a consortium of West German firms and was nearing completion late in 1971.

Gem Stones.—Uncut Burmese jade continued to be of importance in world jewelry circles. Annual output usually varies between 52,300 and 93,300 kilograms of uncut jadeite. Since many mines are in insurgent territory near the border, additional jade presumably was produced and smuggled out of the country. Burma also produces ruby, sapphire, spinel, other "precious stones," and cultured pearls. The pearl industry was nationalized in 1964, when the Japanese part of a joint venture was dissolved. Producers of jade and precious stones were first required to sell to MDC. By 1970, both these industries had become totally nationalized.

During the eighth annual emporium held in Rangoon in March 1972, sales totaled $2.3 million, including $1.7 million for jade, $362,250 for pearls, and $148,000 for precious stones. Pearl sales have lost ground steadily since the Japanese left. Recorded output of precious stones also declined sharply since nationalization.

Salt.—Burma produces the salt it needs, which amounted to about 185,000 tons during 1971. Early in 1970 the Burma Salt Industries, the sole operator harvesting salt from brine pits located along the Indian Ocean coast, started a modernization program. The company has placed a $1 million order with Allis-Chalmers Manufacturing Co. for tractor scrapers, crawler dozers, and graders to build pits, dikes, and channels, which will replace elephants and bullocks formerly employed.

Other Nonmetallics.—An Industrial Raw Materials Committee helps MDC supervise various small, nonmetallic industries, which include fire clay from Pegu Yomas east of Minhla and from Kyaukpadaung; fluorspar from Kalaw; soapstone from Katha; graphite from Wapyudaung; manganese dioxide from Kyaukpadaung; bentonite from Shwebo; gypsum from Chauk; dolomite from Kalaw and feldspar from Thazi and Taungtha for the Syrium glass factory; quartz from Choungzon in Amherst district; and barite from Kyaukse and elsewhere. Barite and bentonite extraction were being stepped up because of growing demand by MOC. The industrial clay near Minhla may turn out to be rather important.

MINERAL FUELS

Coal.—The Kalewa coalfield in the northwest, sole producer in Burma, produced about 19,700 tons of low-grade coal during 1971, compared with only 15,000 tons during 1970. Burma's imports of coal are also small.

Petroleum.[6]—Burma intensified offshore exploration in 1971 and prepared to begin exploratory drilling in the Gulf of Martaban, financed by a Japanese loan. The Government continued to seek foreign governmental assistance in 1971. In addition to the loan from Japan, it received a $2.8 million loan from the Eximbank to help finance the purchase of six U.S. onshore drilling rigs and ancillary equipment.

Onshore, based largely upon expanded production at the new Mann field, crude output continued to climb and probably reached 20,000 barrels per day by late 1971. Production at Burma's other fields either held its own or declined. Chauk and Yenangyaung, Burma's old fields, although declining slowly, still accounted for about 6,000 barrels per day between them. Myanaung, which also produced about 6,000 barrels per day, is declining more rapidly than expected, even though secondary recovery methods have been instituted. The Prome field is holding its own at about

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[6] U.S. Embassy, Rangoon, Burma. Annual Petroleum Report. State Department Airgram A-183, Dec. 21, 1971, pp. 1-12.

2,000 barrels per day. Production at Shwepyitha has shut down completely.

Operating at about 91-percent capacity (1,125,000 gallons per day), Burma's two refineries at Syriam and Chauk processed almost 375 million gallons of refined products in 1970–71, the fifth consecutive year that refined production has increased.

In 1971 Burma added a new item to its small list of petroleum export products, naphtha. For the past 2 years MOC has had excess naphtha available for sale from its refinery at Syriam, where 60,000 tons were reportedly processed in 1970–71. In March MOC made its first sale, contracting with Mitsui of Japan to sell 20,000 tons. Burma also exports a few thousand tons of petroleum coke mainly to Japan and Malaysia, and wax (figures unknown). In addition, Burma earns about $42,000 per month from the sale of jet aviation fuel to airlines using Mingaladon Airport.

Burma continued to import sizable quantities of crude oil during the year because production was unable to keep up with consumption. Imports of crude oil during the fiscal year were 80 percent greater than the previous year.

Offshore, after the seismic survey conducted in late 1970 and early 1971 by the West German firm Prakla, MOC issued tenders for drilling exploratory wells in the Gulf of Martaban. The contract was awarded to the firm Reading & Bates, largely on the basis of the technical suitability of its rig, the MG Hulme. The work is being financed by a long-term Japanese loan of $10 million, which is untied to the use of Japanese equipment and companies. Preparatory to drilling, Japan Petroleum Exploration Co. conducted a detailed seismic survey of part of the area covered in the initial survey by Prakla. Drilling was scheduled to begin in early 1972.

Onshore exploration covered about 9,475 square miles in fiscal year 1970–71, up from 8,323 square miles in 1969–70. Exploration work included geological, magnetic, and seismic surveys and ranged over most of the country, although there appeared to be a shift in emphasis from the Arakan coastal region to Lower Burma in the Rangoon area. The two most promising areas surveyed were the Thayetmyo region on the west bank of the Irrawaddy between Prome and the Mann field and the area around Rangoon. Both areas were scheduled for exploratory drilling in the coming year. Uncertainties regarding security in Burma have made distribution difficult, and most of the crude is being shipped to refineries by water and trucks rather than by pipeline.

The Mineral Industry of Canada

By J. Patrick Ryan [1]

The value of Canada's mineral production increased about $203 million [2] in 1971 to a record total of $5,851 million. This represents a gain of nearly 4 percent over the value of minerals produced in 1970 and marks the 13th consecutive annual increase. Compared with an average annual growth rate of 12 percent in the 10-year period 1961–70, the slower growth rate in 1971 mainly reflected a decline in value in the metal-producing sector which was more than offset by gains in the nonmetals and fuels sectors of the mineral industry. In 1971, preliminary estimates show that metallic mineral output declined 4 percent to $2,902 million, nonmetallics gained 3 percent to $488 million, mineral fuels increased 17 percent to $1,984 million, and structural materials increased 9 percent to $477 million. These four sectors accounted for 50 percent, 8 percent, 34 percent, and 8 percent, respectively, of the total production.

Mineral production represented about 6.4 percent of Canada's estimated gross national product (GNP) of $92,070 million in 1971 compared with 6.8 percent and a GNP of $83,539 million in 1970. Based on a population of 21.7 million, per capita value of mineral production in 1971 increased $5.62 to a new record of $272.86, one of the highest in the world.

The value of exports of mineral fuels increased sharply in 1971 but the value of most other mineral exports except potash, asbestos, and a few others, declined. About 60 percent of Canada's crude and processed mineral products were exported to more than 90 countries. In the period 1966–71, the value of mineral products exported grew at an average rate of 13 percent per year, reaching $4.9 billion in 1971. Mineral imports, principally processed metals and fuels, were valued at $2.4 billion, resulting in a favorable trade balance of about $2.5 billion.

According to data compiled by the Dominion Bureau of Statistics, the minerals industry was a major contributor to the 4-percent rise in Canada's real domestic product in 1971. The minerals index was up 3 percent to 180.1 (1961 base = 100) compared with a 16-percent gain in 1970. The index for agriculture and construction were up 34 percent and 7 percent, respectively, but most other industries recorded small gains except forestry, which was below the 1970 level.

Of the 62 mineral commodities produced in Canada in 1971, the following nine leading minerals accounted for 83 percent of the total mineral value of $5,851 million in 1971: Petroleum, $1,336 million (23 percent); nickel, $789 million (13 percent); copper, $746 million (13 percent); iron ore, $554 million (10 percent); natural gas and byproducts, $515 million (9 percent); zinc, $406 million (7 percent); asbestos, $208 million (3 percent); cement, $192 million (3 percent); and lead, $109 million (2 percent). In addition to these indigenous mineral products and generally excluded from official mineral production statistics, Canada produced primary aluminum from bauxite and alumina imports valued at over $587 million in 1971. Canada ranks third in world metal production, and fifth in nonmetal production in terms of value. Canada is the world's leading producer of zinc, asbestos, silver, nepheline syenite, nickel, and selenium and is the second largest producer of gypsum, molybdenum, potash, sulfur, titanium, and uranium.

Seven of Canada's 12 Provinces and Territories attained record mineral production in 1971. Alberta surpassed Ontario for the first time and accounted for nearly 28 percent of the total value of mineral production. Most of Alberta's increased production came from expansion in the fuels sector—coal, natural gas, and petroleum—which together accounted for about 92 percent of the total value of Alberta's output. Ontario's production declined about 2 percent to 26 percent of the total value as a result of lower production values in the metals sector. Most of the value of Ontario's output was attributed to production of nonferrous metals and their byproducts. Quebec's production declined about 4 percent and accounted for 13 percent of the total. The proportion of total production value for British Columbia increased slightly to 9 percent. Mineral production values declined in Saskatchewan, Newfoundland, and Manitoba and accounted for 6.5 percent, 5.7 percent, and 5.4 percent, respectively, of the total. These Provinces were followed in order by New Brunswick, Northwest Territories, Yukon Territory, Nova Scotia, and Prince Edward Island, which together accounted for nearly 6.4 percent of the total value of Canada's 1971 mineral production.

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[1] Mining engineer, Division of Nonferrous Metals.

[2] Values quoted in this chapter have been converted from Canadian dollars (Can$) to U.S. dollars. Conversion of 1971 values has been at the average annual rate of Can$1 = US$0.989; conversion of 1970 values has been at the average annual rate of Can$1 = US$0.958; for years 1962–69, conversion has been at Can$1 = US$0.925.

General wholesale price indexes for minerals and metals in 1971 and 1970 (the latter in parentheses) compared with the 1935–39 base period index of 100 were as follows: Nonferrous metals, 260.9 (281.0); iron products, 315.5 (305.9); and nonmetallic mineral products, 225.4 (215.8). Average weekly earnings of a mining industry employee was Can$177.19 in December 1971 compared with Can$164.70 in the same month in 1970. Capital expenditures for new construction and equipment in mining and mineral processing industries, including petroleum and gas wells, totaled $1,779 million in 1971 compared with $1,387 million in 1970. Metal mines, smelters, and refineries accounted for expenditures totaling $372 million; industrial minerals and coal projects, $711 million; and petroleum and gas wells, $696 million. Dividends paid by 62 Canadian companies totaled $327.5 million, compared with $388 million in 1970 and $347 million in 1969. Among the largest dividend payers in 1971 were International Nickel Company of Canada, Ltd., (Inco), $96.9 million; Imperial Oil, Ltd., $77.0 million; Iron Ore Co. of Canada, Ltd., $32.1 million; Steel Co. of Canada, $30.4 million; Noranda Mines, Ltd., $29.0 million; Pine Point Mines, Ltd., $20.3 million; Falconbridge Nickel Mines, Ltd., $13.6 million; and Cominco, Ltd., $11.7 million. Each of 10 others paid over $5 million.

Mineral exploration activity was sharply curtailed in 1971 as several foreign mining companies reduced or suspended the search for new ore deposits in Canada, closed their Canadian exploration offices, and cut their staffs. The general cutback in the scale of exploration reflected rising costs, lower metal prices, oversupply of some commodities, impending unfavorable legislation, and worldwide economic and monetary uncertainties.

Despite the general slowdown in exploration activity, exploration expenditures in 1971 were estimated to have been near $100 million. Work continued on base metal prospects in Nova Scotia both on the mainland and on Cape Breton Island. In New Brunswick, investigations of lead-zinc-copper deposits continued in the Bathurst-Newcastle area, and an airborne geophysical survey was carried out to stimulate exploration interest in the Caledonia area. In Quebec, exploration for base metals continued in several of the older mining camps, including geological, geophysical, and geochemical studies in the Noranda area, and several asbestos prospects were undergoing tests. In Ontario, exploration activity also continued in the Timmins-Kirkland Lake belt and in the Sturgeon Lake area. Significant exploration and development activity continued in the coal areas near the Alberta-British Columbia border and in the porphyry copper-molybdenum deposits in British Columbia and the Yukon.

PRODUCTION

Canada's mineral production in 1971 as recorded by the Minerals Resources Branch, Department of Energy, Mines, and Resources included 27 metals, 31 nonmetals and structural materials, and four types of fuels. Mineral products not included in the totals are alumina, aluminum metal, and ferroalloys made in Canada from imported raw materials, abrasives, lightweight aggregates, and carbon black. All of the mineral fuels and some of the nonmetals increased in quantity and value but output of most metals declined compared with production levels of 1970.

The value of British Columbia's mineral production in 1971 increased 8.5 percent to a record of $531.6 million mainly because of a 15-percent gain in the output of copper, which accounted for nearly 27 percent of the total. Crude petroleum production declined slightly and represented 11.5 percent of the total. Production of structural materials increased nearly 20 percent in value. Zinc output increased 14 percent and accounted for about 9 percent of the total but the value of lead production, representing about 6 percent of the total, was slightly less than in 1970 because of lower metal prices despite a 15-percent gain in volume. Production of molybdenum, most of which comes from this Province, declined 19 percent in value and represented about 8 percent of the total value of mineral production.

Alberta's mineral production value increased 11 percent in 1971, to $1,652 million. Crude petroleum production provided nearly 65 percent of the total. Output of natural gas and natural gas byproducts increased to $268 million and $196 million, respectively. Low sulfur prices reduced the value of sulfur production. The value of coal output increased nearly 88 percent mainly because of continued strong demand from Japan for the metallurgical grade.

The value of Ontario's mineral production declined $27.5 million in 1971, to $1,563 million, a sharp reversal of the gain in 1970. Nickel and copper accounted for about 58 percent of the total value. The value of nickel declined about 3 percent, to $589 million, and the value of copper decreased nearly 6 percent to about $321 million. The value of zinc production increased 17 percent, to nearly $127 million.

In Quebec, production of copper, the leading mineral commodity in terms of value, declined 1.5 percent to $197 million, accounting for nearly 26 percent of the total mineral value. Asbestos production decreased 1.8 percent in value, to about $159 million, and provided nearly 21 percent of the total value. The value of structural materials increased nearly 10 percent to $114 million and accounted for about 15 percent of the total. Iron ore production, which accounted for nearly 15 percent of the Province's total mineral value, decreased 15 percent in 1971, to $113 million. Other leading commodities produced in Quebec included zinc, titanium dioxide, and gold.

Saskatchewan's mineral production value increased nearly 1 percent in 1971, to $382 million. Petroleum, the leading mineral commodity, increased slightly in value to nearly $202 million, about 53 percent of the total. Potash production was valued at $128 million, representing a gain of nearly 18 percent over that of 1970, and accounted for one-third of the provincial total. Structural materials increased about 11 percent to slightly more than $11 million and accounted for nearly 3 percent of the total value. Other important commodities produced in the Province included natural gas, copper, coal, and uranium.

Newfoundland's mineral production declined about $16 million in value, to $337 million. The major commodity, iron ore, declined almost 2 percent in value and accounted for 85 percent of the total value of mineral production in the Province. Asbestos production increased 20 percent in value and accounted for about 4 percent of the total value. Production of copper, lead, and zinc declined nearly 23 percent in value because of a labor strike and accounted for 4 percent of the provincial total.

In Manitoba, the value of production declined in all sectors of the mineral industry except structural materials, which increased 6 percent. Cutbacks in output of nickel-copper ore and reduction of some copper-zinc operations because of labor disputes accounted for most of the 4-percent decline in the Province's mineral production total.

Mineral production in New Brunswick increased about 3 percent in value, to $107 million, with gains achieved in all sectors of the mineral industry. In the metals sector, the value of copper and zinc output increased but lead declined slightly because of lower metal prices. In the fuels sector, most of the gain in value of output came from increased coal production.

In the Northwest Territories, mineral production declined about $34 million in value, to $99 million. Lower zinc and lead production accounted for most of the decline in value. These metals comprised 85 percent of the total output value. The value of gold and silver production, which also decreased, accounted for 13 percent of the total.

Increased production of gypsum, salt, and coal accounted for most of the 5-percent increase in the value of Nova Scotia's mineral production. Cement, clay products, and sand and gravel production registered small gains but the value of metals output, chiefly lead, declined appreciably.

Table 1.—Canada: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971^{p}
METALS			
Aluminum:			
Alumina ... thousand tons	^{r}1,005	1,105	1,140
Metal, refined ... do	^{r}979	972	1,002
Antimony [1]	372	329	149
Arsenic, white	154	64	--
Bismuth [2]	263	268	121
Cadmium [3]	^{r}1,926	1,954	1,874
Calcium ... kilograms	427,593	201,193	138,891
Cobalt [4]	1,477	2,068	2,264
Columbium concentrate (pyrochlore), gross weight	3,098	4,462	4,536
Copper:			
Mine, recoverable	520,039	610,279	653,100
Smelter, refined	^{r}408,373	488,700	477,588
Gold ... thousand troy ounces	2,545	2,409	2,243
Iron and steel:			
Iron ore ... thousand tons	36,337	47,459	43,976
Pig iron ... do	6,741	8,243	7,816
Ferroalloys ... do	185	190	193
Crude steel ... do	^{r}9,115	11,200	11,040
Rolled steel ... do	^{r}7,244	8,241	8,997
Lead:			
Mine production	^{r}302,005	357,195	393,233
Refined, primary	169,773	185,637	168,357
Magnesium	9,650	9,392	6,579
Mercury ... 76-pound flasks	21,200	24,400	^{e}18,000
Molybdenum	13,450	15,319	12,082
Nickel [5]	193,785	277,490	266,664
Platinum-group metals ... troy ounces	310,404	482,428	468,000
Selenium, refined ... kilograms	^{r}372,071	387,573	325,679
Silver ... thousand troy ounces	43,531	44,251	45,950
Tantalum concentrate, gross weight	112	269	295
Tellurium, refined ... kilograms	^{r}32,960	29,317	19,758
Thorium (shipments) ... do	13,161	--	--
Tin, mine ... long tons	129	118	131
Titanium:			
Ilmenite, gross weight	1,673 080	2,257,657	^{e}2,285,000
Titanium slag (70–72 percent TiO_2)	^{r}679,696	766,300	775,200
Tungsten concentrates (W content)	1,462	1,387	1,802
Uranium (U_3O_8)	3,497	3,723	3,638
Yttrium (Y_2O_3) (shipments) ... kilograms	38,756	33,112	NA
Zinc:			
Mine output, Zn content	^{r}1,200,677	1,253,095	1,270,211
Refined, primary	423,072	417,907	371,973
NONMETALS			
Asbestos ... thousand tons	1,462	1,507	1,483
Barite	129,936	133,583	124,284
Cement, hydraulic [6] ... thousand tons	7,484	7,208	8,649
Clays and products [7] ... value, thousands	$47,328	$39,461	$43,313
Diatomite (shipments)	442	^{e}440	^{e}455
Feldspar (shipments)	11,235	9,667	9,072
Fluorspar	119,400	124,100	^{e}72,600
Gypsum and anhydrite ... thousand tons	5,782	5,732	6,169
Lime ... do	1,483	1,495	^{e}1,378
Lithium minerals [8]	181	424	NA
Magnesite and brucite ... value, thousands	$2,969	$3,082	$2,775
Nepheline syenite	454,111	441,497	453,593
Potash (shipments, K_2O equivalent)	3,167,890	3,102,573	3,512,620

See footnotes at end of table.

Table 1.—Canada: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971 [p]
NONMETALS—Continued			
Pyrite and pyrrhotite: [9]			
Gross weight	341,246	329,008	288,485
Sulfur content	155,321	159,232	139,706
Salt ... thousand tons	4,225	4,862	5,060
Sand and gravel ... do	182,872	183,846	182,752
Sodium sulfate	470,193	445,017	.435,449
Stone [10] ... thousand tons	[r] 67,477	65,323	64,800
Strontium minerals [e]	12,000	16,000	54,000
Sulfur, elemental, byproduct:[11]			
From smelter gases	613,429	640,360	613,257
From processing of crude oil, natural gas and nickel sulfide matte ... do	2,697,520	3,218,974	2,780,522
Talc, soapstone and pyrophyllite (shipments)	68,810	65,367	60,781
MINERAL FUELS AND RELATED MATERIALS			
Coal:			
Bituminous and subbituminous ... thousand tons	7,849	11,596	13,728
Lignite ... do	1,833	3,467	2,994
Coke, high temperature ... do	4,538	5,143	4,631
Natural gas:			
Gross production ... million cubic feet	[r] 2,287,433	2,625,927	2,825,306
Marketed production ... do	1,977,838	2,277,109	2,738,900
Natural gas liquids:			
Gross production:			
Propane ... thousand 42-gallon barrels	17,941	21,344	24,269
Butane ... do	11,760	13,846	15,439
Pentanes plus ... do	37,687	43,306	45,992
Condensate ... do	801	846	880
Total ... do	68,189	79,342	86,580
Production returned to formation, all types ... do	718	671	543
Peat moss ... thousand tons	[r] 330	317	326
Petroleum:			
Crude ... thousand 42-gallon barrels	410,990	461,180	492,568
Refinery products:			
Gasoline ... do	156,655	164,745	168,161
Kerosine and jet fuel ... do	31,619	35,756	39,165
Distillate fuel oil ... do	118,208	127,756	138,924
Residual fuel oil ... do	64,044	70,851	89,631
Lubricants ... do	1,964	2,623	2,726
Other products ... do	33,906	35,934	39,736
Refinery fuel and losses ... do	[r] 27,565	29,262	31,226
Total ... do	[r] 433,961	466,927	509,569

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] Antimony content of antimonial lead alloys, flue dust and dore slag.

[2] Refined metal and bullion plus recoverable bismuth content of concentrates exported.

[3] Refined metal from domestic ores plus cadmium content of some exported ores and concentrates.

[4] All forms except cobalt in nickel sinter shipped to the United Kingdom by International Nickel Co., but including cobalt from Falconbridge nickel-copper matte shipped to Norway.

[5] Refined nickel plus nickel content of oxide produced plus recoverable nickel in matte exported.

[6] Cement shipped and/or used by producers.

[7] Includes value of bentonite and products from common clay, stoneware clay, fire clay and other types of clay.

[8] U.S. imports of lithium minerals from Canada.

[9] Shipments (see footnote 11).

[10] Crushed, building, ornamental, paving and others for similar uses.

[11] Excludes sulfur content of pyrite which was included here in previous editions (see under pyrite). Data presented are shipments, which differ from actual production by that amount stockpiled by producers; actual output is not reported, but available Canadian sources indicate a substantial difference between estimated total production and shipments.

TRADE

According to preliminary data compiled by the Bank of Canada the total value of metals, minerals, and mineral products exported from Canada in 1971 was $4.9 billion. This represented about 27.6 percent of Canada's total commodity exports or more than 40 percent if fabricated mineral products are included. In 1971 the distribution of principal mineral commodity exports in million dollars were: Fossil fuels, $1,037; iron ore, $823; nickel, $714; copper, $604; aluminum, $467; asbestos, $229; zinc, $212; potash, $142; gold, $79; lead, $67; silver, $63; coal, $53; molybdenum, $45; sulfur, $28; platinum metals, $26; and uranium, $18. Canada's principal mineral export markets in million dollars and percent of the total in 1971 were: United States, $2,924.6 (59.4 percent); United Kingdom, $591.2 (12.0 percent); European Economic Community (EEC), $405.1 (8.2 percent); Japan, $398.2 (8.1 percent); other countries, $608.5 (12.3 percent).

Table 2.—Canada: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum:			
Alumina (excluding abrasive grades), Al content	18,421	21,570	United States 15,599; Spain 968.
Metal:			
Scrap	47,099	42,014	United States 29,914; Italy 8,328; West Germany 2,053.
Unwrought	804,389	761,670	United States 294,653; United Kingdom 168,094; Japan 82,705.
Semimanufactures	r 17,386	14,200	United States 5,564; New Zealand 2,648; Republic of South Africa 1,918.
Cadmium	765	703	United Kingdom 571; United States 123; West Germany 4.
Calcium kilograms	328,673	78,970	United States 58,922; Belgium-Luxembourg 10.
Cobalt:			
Metal	524	381	United States 317; Japan 23; Switzerland 22.
Oxides and salts, gross weight	544	837	United Kingdom 745; Belgium-Luxembourg 92.
Columbium concentrate [1] kilograms	r 417,113	576,226	All to United States.
Copper:			
Ore and matte, Cu content	143,169	162,494	Japan 115,416; Norway 29,182.
Slag, skimmings and sludge, Cu content	227	200	United States 137; Sweden 34; United Kingdom 29.
Metal:			
Scrap, unalloyed	r 36,546	28,692	Belgium-Luxembourg 7,946; West Germany 7,408.
Scrap, copper alloys	21,142	18,941	West Germany 6,632; Japan 3,834; Belgium-Luxembourg 2,966.
Unwrought, unalloyed	190,539	265,264	United Kingdom 101,560; United States 83,562; West Germany 35,450.
Semimanufactures, unalloyed	35,594	37,280	United States 15,517; Norway 2,987; Denmark 2,433.
Semimanufactures, copper alloys	13,684	15,875	United States 10,443; Japan 2,992; Italy 343.
Iron and steel:			
Iron ore thousand tons	r 31,254	39,348	United States 24,224; United Kingdom 4,997; Netherlands 3,158; Japan 2,230.
Pig iron and related materials do	r 673	604	United States 242; Japan 159; West Germany 72.
Ferroalloys:			
Ferromanganese	5,000	510	United States 448; United Kingdom 59.
Ferrosilicon	r 43,997	45,345	United Kingdom 23,842; United States 12,271; Australia 2,575.
Other	2,921	3,715	Netherlands 1,315; United States 1,024; United Kingdom 581.
Steel ingots and other primary forms thousand tons	156	150	United States 100; West Germany 21; Belgium-Luxembourg 20.
Semimanufactures do	894	1,512	United States 1,061; United Kingdom 68; Greece 43.
Lead:			
Ore and concentrate, metal content	127,165	150,513	Japan 69,926; United States 37,213.
Metal:			
Scrap including alloy scrap	5,726	5,209	United States 1,724; Republic of South Africa 1,386; Belgium-Luxembourg 1,009.
Unwrought, unalloyed	97,150	138,637	United States 51,678; United Kingdom 50,999; India 17,154.
Semimanufactures	3,349	6,011	United States 5,971.
Magnesium metal	(2)	6,957	United Kingdom 1,801; West Germany 1,302; United States 1,276.
Mercury [1] 76-pound flasks	15,546	17,872	All to United States.
Molybdenum ore and concentrate, Mo content	r 10,240	13,759	United Kingdom 3,768; Japan 2,282; Netherlands 2,200.
Nickel:			
Ore, matte and speiss, Ni content	r 69,830	87,688	Norway 42,139; United Kingdom 36,371.
Oxide, Ni content	r 26,320	39,822	United States 24,799; United Kingdom 9,316; Belgium-Luxembourg 4,514.
Metal:			
Scrap	4,571	3,916	United States 2,057; West Germany 679; United Kingdom 373.
Unwrought	94,567	138,984	United States 93,790; United Kingdom 23,928; Belgium-Luxembourg 5,811.
Semimanufactures	2,983	3,311	United States 1,594; Netherlands 481; Brazil 409.

See footnotes at end of table.

Table 2.—Canada: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS—Continued			
Platinum-group metals:			
Concentrates, residues and matte, metal content troy ounces	433,747	638,504	United Kingdom 622,611; Norway 15,843.
Metal:			
Scrap do	35,810	30,262	United States 17,282; United Kingdom 12,980.
Other do	29,753	11,562	United States 6,887; West Germany 2,344; United Kingdom 1,951.
Selenium metals and salts, Se content kilograms	395,668	311,209	United States 204,298; United Kingdom 92,487; Belgium-Luxembourg 4,536.
Silver:			
Ore and concentrate, Ag content thousand troy ounces	21,883	21,028	United States 13,217; Belgium-Luxembourg 2,932; Sweden 2,696.
Metal refined do	34,659	24,200	United States 23,096; Belgium-Luxembourg 985; United Kingdom 102.
Tin ore and concentrate, Sn content long tons	[r] 340	264	Mexico 181; United States 77; Belgium-Luxembourg 5.
Titanium:			
Ilmenite and ilmenite sand [1]	261,315	27,727	All to United States.
Titanium slag, 70 percent TiO_2 [1]	[r] 74,688	122,466	Do.
Uranium and thorium concentrates value, thousands	$22,669	$24,069	United States $15,754; United Kingdom $8,315.
Zinc:			
Ore and concentrate, Zn content	729,979	767,470	United States 307,422; Belgium-Luxembourg 171,317; Japan 93,590.
Metal:			
Scrap, dross, and ashes	8,002	6,714	United States 3,129; Netherlands 1,240; Belgium-Luxembourg 901.
Unwrought	278,864	318,834	United States 110,048; United Kingdom 86,318; India 26,180.
Semimanufactures	5,236	7,185	United States 4,544; United Kingdom 1,519; Singapore 306.
NONMETALS			
Abrasives:			
Fused alumina, crude grains	167,789	152,548	United States 140,561; United Kingdom 11,418; Japan 526.
Silicon carbide, crude and grains	93,894	96,158	United States 93,461; Norway 2,678.
Asbestos:			
Crude	122	92	Japan 66; West Germany 11.
Milled fiber, all grades thousand tons	1,419	1,417	United States 557; Japan 152; United Kingdom 90.
Barite, crude	98,529	90,305	United States 85,305; Venezuela 500.
Cement, portland	575,343	513,940	United States 513,920.
Clays and products value, thousands	[r] $11,177	$11,693	United States $7,017; United Kingdom $611; Dominican Republic $367.
Fertilizer materials:			
Nitrogenous thousand tons	NA	824	United States 699; Pakistan 57.
Potassic do	[1] 3,364	4,966	United States 3,844; Japan 549; India 128.
Mixed do	NA	724	United States 599; India 84.
Gypsum, crude do	4,419	4,403	United States 4,350; Bahamas 52.
Lime	177,046	181,994	United States 180,687.
Nepheline syenite	358,894	351,940	United States 331, 167; United Kingdom 4,771.
Salt value, thousands	[r] $5,107	$7,430	United States $7,131; Cuba $231.
Sand and gravel thousand tons	415	1,125	Mainly to United States.
Sodium sulfate	[r] 10,924	10,876	United States 9,535; Republic of South Africa 822.
Stone:			
Limestone, crude, crushed and refuse thousand tons	1,499	1,347	Mainly to United States.
Quartzite do	74	59	All to United States.
Rough building and crude, n.e.s. do	164	660	Mainly to United States.
Sulfur, crude and refined do	2,054	2,711	United States 1,071; India 347.
Talc and soapstone [1]	[r] 7,423	6,474	All to United States.
MINERAL FUELS AND RELATED MATERIALS			
Coal, bituminous thousand tons	1,250	3,893	Japan 3,741; United States 136.
Coke from coal	[r] 247,658	247,662	United States 117,097; Romania 44,423; West Germany 33,040.
Fuel briquets, coal and coke	18,176	20,142	All to United States.
Natural gas million cubic feet	669,816	768,113	Do.
Petroleum:			
Crude thousand 42-gallon barrels	197,341	240,893	Do.

See footnotes at end of table.

Table 2.—Canada: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Refinery products:			
Gasoline thousand 42-gallon barrels	441	563	United States 552; St. Pierre-Miquelon 11.
Distillate fuel oil do	[r] 3,382	4,727	United States 4,225; St. Pierre-Miquelon 496.
Residual fuel oil do	[r] 2,881	5,628	United States 5,623; Japan 5.
Lubricants do	19	16	United States 7; St. Pierre-Miquelon 5; Australia 2.
Liquefied petroleum gas do	[r] 15,896	20,788	United States 17,720; Japan 3,064.
Asphalt do	--	760	United States 757.
Petroleum coke do	13	266	United States 138; Italy 65; France 38.
Petroleum and coal products, n.e.s. do	(3)	264	United States 248; West Germany 9.

[r] Revised.

[1] Partial figures; data given are United States imports for consumption only.

[2] Quantity not available, value for 1969 was US$4,372,000 compared with US$5,146,000 for total quantity listed for 1970.

[3] Quantity not available, value for 1969 was US$2,220,000 compared with US$1,341,000 for total quantity listed for 1970.

Table 3.—Canada: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum:			
Bauxite thousand tons	2,260	2,525	Guyana 2,069; Malaysia 160; Surinam 158.
Alumina do	964	943	United States 350; Jamaica 317; West Germany 166.
Metal:			
Scrap, including alloys	14,133	5,201	All from United States.
Unwrought	10,461	12,179	United States 9,804; United Kingdom 1,435; Norway 727.
Semimanufactures (including tubes, wire and cable)	87,472	80,918	United States 75,670.
Antimony oxides and salts, Sb content	358	383	United Kingdom 332; United States 51.
Chromium ore and concentrate, Cr content	38,034	27,620	United States 11,999, Philippines 6,909; U.S.S.R. 6,051.
Copper:			
Ores, concentrates and scrap, Cu content	9,557	10,100	United States 8,949.
Oxides and sulfate	1,420	2,249	United States 1,590; Belgium-Luxembourg 310.
Metal:			
Unalloyed:			
Unwrought	16,453	13,192	United States 11,256; Norway 1,388.
Semimanufactures	2,783	2,119	United States 1,348; Japan 455.
Alloys, unwrought and semimanufactures	7,941	7,883	United States 6,995; United Kingdom 439.
Iron and steel:			
Iron ore thousand tons	2,297	2,160	United States 2,005; Brazil 146.
Scrap do	[r] 746	751	Mainly from United States.
Pig iron	20,814	87	All from United States.
Ferroalloys:			
Ferrochrome	22,791	20,814	Republic of South Africa 12,110; United States 8,212.
Ferromanganese	22,248	17,891	Republic of South Africa 16,763; United States 926.
Silicomanganese	4,136	975	Republic of South Africa 351; Norway 337; United States 287.
Ferrosilicon	8,210	9,476	United States 8,626; Norway 738.
Ferrotungsten	95	91	United Kingdom 69; United States 21.
Ferrovanadium	355	171	All from United States.
Other	4,063	6,659	United States 4,450; United Kingdom 1,419; France 650.
Steel ingots and equivalent primary forms	273,205	227,251	United States 221,277; West Germany 4,260.
Iron and steel semimanufactures:			
Castings and forgings	[r] 75,434	154,486	United States 150,360; United Kingdom 1,234.
Rolled steel, including structurals and rails	[r] 1,412,996	999,199	United States 410,702; Japan 267,313; United Kingdom 80,169.

See footnote at end of table.

Table 3.—Canada: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS—Continued			
Iron and steel—Continued			
Iron and steel semimanufactures—Continued			
Pipes, tubes, wires and cables	[r]275,731	225,574	Japan 87,625; United States 79,404; United Kingdom 46,662.
Lead:			
Oxide	2,959	1,704	Mexico 944; United States 445; United Kingdom 315.
Unwrought and semimanufactures	489	2,342	United States 2,151.
Magnesium metal	1,835	1,807	United States 1,312; U.S.S.R. 488.
Manganese:			
Ore and concentrate, Mn content	97,935	1,150,521	Brazil 375,321; Gabon 245,843; Zaire (formerly Congo–Kinshasa) 149,724.
Metal	2,799	2,311	Republic of South Africa 1,660; United States 395; Japan 256.
Mercury 76-pound flasks	1,758	2,017	Mexico 1,039; Spain 674; United States 293.
Molybdenum, molybdic oxide, gross weight	35	34	All from United States.
Nickel, unwrought and semimanufactures, including alloys	15,257	13,108	Norway 10,693; United States 2,149; West Germany 203.
Platinum-group metals troy ounces	118,946	60,745	United Kingdom 33,908; Republic of South Africa 13,423; United States 13,414.
Silver thousand troy ounces	19,169	4,319	United States 4,315; United Kingdom 4.
Sodium metal	8,561	8,868	United States 8,850; United Kingdom 18.
Tin, blocks, pigs and bars long tons	4,946	5,111	Malaysia 3,802; United States 927; Nigeria 238.
Titanium:			
Dioxide, pure and extended	10,121	9,940	United States 8,482; Finland 931; Belgium-Luxembourg 261.
Metal	344	263	United States 250; Japan 8.
Tungsten ore and concentrate, W content	193	83	United States 82; Thailand 1.
Zinc metal:			
Pigs, slabs, blocks, anodes	700	334	All from United States.
Bars, plates, sheets, discs, shells	517	873	United States 657; West Germany 138; Belgium-Luxembourg 67.
Fabricated materials	671	439	United States 433; Belgium-Luxembourg 4.
Dust and granules	1,191	645	Mainly from United States.
NONMETALS			
Barite, ground	5,664	6,827	United States 6,758; West Germany 69.
Bentonite, clay and drilling mud	266,687	312,211	United States 264,181; Greece 48,030.
Cement, hydraulic all types	48,440	88,171	United States 70,406; United Kingdom 6,875.
Clays, ground or unground	338,429	277,251	United States 219,273; United Kingdom 57,978.
Cryolite, natural	3,474	2,248	Denmark 2,135; United States 113.
Diamond:			
Gem, unset thousand carats	90	77	Belgium-Luxembourg 28; Israel 26; United Kingdom 5.
Industrial stones do	1,252	1,171	United States 906; United Kingdom 114; Belgium-Luxembourg 92.
Dust do	445	443	United States 419; Ireland 16; Switzerland 4.
Fertilizer materials:			
Nitrogenous, natural and manufactured	57,664	57,398	United States 49,290; Chile 4,588.
Phosphatic:			
Phosphate rock thousand tons	1,977	2,241	United States 2,230.
Manufactured	56,842	113,954	United States 53,055; United Kingdom 109.
Potassic, manufactured	23,201	24,678	All from United States.
Diatomaceous earth	27,635	33,877	Do.
Fluorspar	94,694	85,894	Mexico 57,438; United Kingdom 16,085; United States 12,371.
Fuller's earth	8,842	10,372	Mainly from United States.
Gypsum, crude	74,207	35,271	Mexico 34,473.
Lime	37,400	30,649	United States 30,576; United Kingdom 49.
Magnesium compounds:			
Dolomite, calcined	6,949	5,865	All from United States.
Magnesia dead burned	42,891	61,682	United States 40,422; Yugoslavia 9,831; Greece 6,273.
Mica, crude	3,448	3,422	United States 3,399; United Kingdom 11; India 10.
Salt and brine	631,072	560,659	Mexico 271,699; United States 264,787; Spain 22,789.

See footnote at end of table.

Table 3.—Canada: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
NONMETALS—Continued			
Sand and gravel.......thousand tons..	780	456	Mainly from United States.
Silica sand.......do....	1,166	1,176	United States 1,161.
Sodium sulfate and Glauber's salt......	26,871	26,449	United States 15,346; Belgium-Luxembourg 8,055; United Kingdom 3,048.
Stone:			
Crushed, including stone refuse thousand tons..	55	50	Mainly from United States.
Cut..........	32,680	29,412	United States 21,129; Republic of South Africa 4,942; Italy 1,616.
Sulfur, elemental..........	41,284	48,494	All from United States.
Talc and soapstone..........	31,670	29,999	United States 29,417; Italy 506.
Vermiculite, crude..........	28,539	25,488	United States 20,209; Republic of South Africa 5,279.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bituminous materials, crude value, thousands..	$252	$252	United States $218; East Germany $21; West Germany $12.
Coal:			
Anthracite.......thousand tons..	396	321	All from United States.
Bituminous and subbituminous do....	[r] 15,283	16,713	Do.
Coke from coal, excluding briquets do....	[r] 255	358	United States 301; West Germany 57.
Fuel briquets, coal and coke..........	5,498	9,222	All from United States.
Natural gas.......million cubic feet..	[r] 37,733	11,878	Do.
Petroleum:			
Crude.thousand 42-gallon barrels..	193,125	207,633	Do.
Refinery products:			
Gasoline.......do....	[r] 6,219	5,200	United States 2,514; Spain 1,151; Italy 446; Leeward and Windward Islands 439.
Jet fuel.......do....	[r] 4,734	3,653	Venezuela 2,357; Netherlands Antilles 1,024.
Kerosine and distillate fuel oil:			
Kerosine and gas oil do....	[r] 1,578	314	Venezuela 188; Netherlands Antilles 78; Panama 48.
Other distillate fuel oil do....	[r] 20,539	20,049	Venezuela 10,599; Netherlands Antilles 6,845; Bahamas 1,056.
Residual fuel oil.......do....	[r] 33,269	34,733	Netherlands Antilles 14,338; Venezuela 13,887; United States 4,820.
Lubricants.......do....	[r] 1,723	1,178	Mainly from United States.
Liquefied petroleum gas.do....	[r] 773	327	Do.
Other.......do....	[r] 4,921	5,318	United States 5,060.
Other petroleum and coal products value, thousands..........	[r] $5,723	$5,039	United States $4,002.

[r] Revised.

COMMODITY REVIEW

METALS

Aluminum.—Smelter production of primary aluminum was about 4 percent more in 1971 than in 1970. Smelters of both Aluminum Company of Canada (Alcan) and Canadian Reynolds Metals Company, Ltd., operated at less than full capacity during 1971 because of a general world oversupply situation. Alcan operated four smelters in Quebec and one in British Columbia with a combined output of 857,500 metric tons of aluminum. Canadian Reynolds Metals produced 143,400 tons at its one smelter in Quebec.

Alcan's alumina plant at Arvida treated bauxite mainly from Guyana and Surinam, supplying alumina to the company's Quebec plants for smelting into aluminum. In addition, alumina was imported directly from Australia, Jamaica, and other countries for smelting in the company's plant at Kitimat, British Columbia. Canadian Reynolds imported alumina for its Baie Comeau smelter from its parent company's plants in the United States. In 1971, imports of bauxite into Canada totaled 2.46 million tons and imports of alumina 925,700 tons.

Consumption of aluminum increased 21 percent, to about 258,000 tons. Exports of primary ingot were about 806,000 tons compared with 762,000 tons in 1970. The United States, United Kingdom, Japan, and

West Germany were the principal export markets.

Columbium and Tantalum.—St. Lawrence Columbium and Metals Corp., Canada's only producer of columbium, produced 1,049 metric tons of columbium pentoxide (Cb_2O_5) valued at $2.46 million in the 9-month period from October 1, 1970, to June 30, 1971, compared with 1,679 tons valued at $3.84 million in the first 9 months of the preceding fiscal year. Total production for the fiscal year ending September 30, 1971, was valued at $2.68 million compared with $5.31 million in the 1970 fiscal year. The official price of Canadian pyrochlore concentrates remained at $1.15 to $1.20 per pound of contained Cb_2O_5 for long-term contracts; however, spot prices declined to 95 cents at yearend, and dealers' quotations were as low as 90 cents.

Because of the sharp drop in demand and worldwide oversupply of columbium, St. Lawrence Columbium reduced the tonnage of ore milled at its Oka, Quebec, plant to 370,600 during the fiscal year compared with 657,100 metric tons milled in the corresponding period of 1970. The company reported proven ore reserves totaling 6.44 million tons at its Oka mine with an average grade of about 0.49 percent Cb_2O_5.

Quebec Mining Exploration Co. (SOQUEM) and Copperfields Mining Corp. continued joint exploration of their pyrochlore deposit near Chicoutimi, Quebec, and reported reserves to a depth of 850 feet, totaling 60 million tons with an average grade of 0.65 percent columbium pentoxide (Cb_2O_5). A proposed production schedule was to be based upon the results of economic feasibility studies.

Canada maintained its rank in 1971 as the leading producer of tantalum concentrates with an output of 740,000 pounds, containing approximately 370,000 pounds of tantalum pentoxide (Ta_2O_5). Output of 50 percent Ta_2O_5 concentrate in 1970 was 860,000 pounds. Tantalum Mining Corporation of Canada, Ltd. (Tanco), the country's only producer, reduced the scale of operations at its Bernic Lake mine in line with its long-term contracts. Tanco's ore reserve was estimated at 1.9 million tons with an average grade of 0.23 percent Ta_2O_5, sufficient for 8 to 10 years at the current rate of production.

Copper.—Mine production of copper increased 7 percent in 1971 to a record of 653,100 tons valued at $760 million. However, because of lower world copper prices, the value of production in 1971 was about $19 million less than in 1970. Production of refined copper was 477,588 metric tons, about 11,112 tons less than in 1970. Domestic shipments of refined copper declined 15,226 tons in 1971, to 200,534 tons but exports of refined copper increased 18,107 tons to 283,371 tons. The Canadian producers' price ranged from Can$0.51 per pound in mid-January to Can$0.537 in mid-June, declining to Can$0.503 in late November and remaining unchanged to yearend.

Most of the gain in mine production came mainly from new operations in British Columbia; however, significant production gains also were attained in Ontario, Quebec, and Manitoba which combined accounted for 95 percent of the total Canadian copper production. Ontario contributed about 42 percent of the national total, Quebec accounted for 26 percent, British Columbia 19 percent, Manitoba 8 percent, and four other Provinces and two Territories accounted for the remaining 5 percent.

Significant new developments in the copper-nickel industry in 1971 included initial production from Inco's new 35,000-ton-per-day Clarabelle concentrator which came onstream in November. The new concentrator replaced some older and less efficient facilities at Copper Cliff and increased the Company's milling and concentrating capacity in the Sudbury area by 9,000 tons per day. Construction of Inco's new 2,500-ton-per-day Shebandowan concentrator continued during the year and was scheduled for completion in 1972. Completion of this facility will augment the company's total concentrating capacity to 94,000 tons of ore per day. Improvements at the Copper Cliff copper refinery increased the refinery's efficiency and capacity. Exploration carried out on Inco's properties in Ontario and Manitoba resulted in disclosing additional ore which increased total proven copper-nickel ore reserves by 4 million tons to 387 million tons containing 4 million tons of copper.

Noranda Mines, Ltd., began work on its $133 million expansion of copper production facilities in Quebec. Mill capacity at Gaspé Copper was being increased to 34,000 tons per day, and a leaching plant to treat 5,000 tons of oxide ore per day was being built which will double Gaspé's production of copper in concentrate to 70,000 tons per year. Gaspé will also increase its smelter capacity by 27,000 tons of copper per year and will build a plant to produce 300,000 tons per year of sulfuric acid to control sulfur emissions. At the Horne mine, smelter capacity was being increased by 55,000 tons of copper per year through construction of a newly developed continuous smelting process reactor. At the Montreal East refinery, annual capacity was being increased by 72,000 tons of copper to handle the increased output from the Noranda and Gaspé smelters. This refinery expansion was scheduled for completion by mid-1973.

The Horne mine concentrator treated 619,600 metric tons of ore, producing 89,720 tons of copper concentrate. Ore reserves at yearend were about 1.5 million tons, averaging 2.1 percent copper and 0.175 ounce of gold per ton. Ore reserves were expected to be depleted by yearend 1973. Noranda smelter produced a record of 211,370 metric tons of anode copper from company and custom concentrates. Gaspé Copper Mines concentrator treated a total of 3.6 million metric tons of ore and produced 106,680 tons of concentrate containing 29,850 tons of copper and 184.6 metric tons of molybdenum. Gaspé smelter produced a total of 66,950 tons of anode copper from company and custom ores. Ore reserves at Needle Mountain decreased 1.9 million tons to 25.2 million tons averaging 1.35 percent copper. At Copper Mountain, sulfide ore reserves totaled 228 million tons averaging 0.4 percent copper, and oxide ore reserves remained at 34 million tons averaging 0.45 percent copper. At the Geco mine, output of ore and concentrates reached record levels. About 1.60 million metric tons, averaging 2.27 percent copper, were treated to produce concentrates containing 34,200 tons of copper and coproduct zinc, lead, and silver. Ore reserves were estimated at 29.5 million tons with an average grade of 1.97 percent copper, 4.37 percent zinc, and 1.82 ounces of silver per ton.

In British Columbia, six new copper mines were being prepared for production in 1972. These included the Lornex mine of Rio Algom Mines, Ltd., and the Gibraltar mine of Placer Development, Ltd., each of which will have production capacity exceeding 30,000 tons per day. Newmont Mining Corp.'s Similkameen mine will produce 15,000 tons and Noranda Mines' Bell mine 10,000 tons per day. Alwin Mining Co., Ltd., and Nadina Explorations, Ltd., will each have plants with 500-tons-per-day capacity. Utah International, Inc., began productive operations at its Island Copper mine on Vancouver Island. Rated mill capacity is 33,000 tons per day of ore, averaging 0.52 percent copper and 0.025 percent MoS_2.

Refined copper shipments to domestic consumers totaled 200,540 metric tons in 1971, compared with 215,760 tons in 1970. According to 1970 data, consumption of primary copper in semimanufactured products, in percent, was copper sheet, strip, bars, pipe, and tubes, 34 percent; brass mill products, 15 percent; wire and rod mill products, 50 percent; and miscellaneous, 1 percent.

Exports of copper in unrefined materials and in refined shapes totaled 487,360 metric tons in 1971, compared with 427,782 tons in 1970. Most of the copper exported in concentrates went to Japan.

Gold.—Production of gold continued its downward trend in 1971, and nine lode gold mines that had a combined production of over 200,000 ounces in 1970 closed in 1971 as ore reserves became depleted. Gold output during the year declined about 7 percent to 2.24 million ounces valued at $79.3 million. Twenty-one lode gold mines were operating in Canada at yearend and accounted for about 79 percent of the total production; gold recovered as a byproduct of base metal production accounted for virtually all of the remainder.

Two mines in Ontario sold the gold produced on the free market. One mine in Quebec and three in the Northwest Territories sold part of the gold produced on the free market and part to the Mint and were eligible for assistance under provisions of the Emergency Gold Mining Assistance Act (EGMA) on gold sold to the Mint. All other mines sold their gold to the Mint and received assistance payments on total production.

The average price paid by the Royal Canadian Mint in 1971 was Can$35.34 per ounce compared with Can$36.57 in 1970.

Ontario accounted for 50 percent of Canada's total gold production, followed by Quebec with 29 percent and the Northwest Territories with about 14 percent; the remaining 7 percent came from six other Provinces and one Territory.

Iron Ore, Pig Iron, and Steel.—Production of iron ore including byproduct ore decreased 1.7 million tons to 46.6 million tons. Ore production exceeded shipments by about 2.6 million tons, and stocks at mines and ports increased to 12.8 million tons. The reduction in ore shipments mainly reflected lower steel production in Western Europe and the United States. Notwithstanding increased shipments to Japan, pig iron production declined 5 percent to 7.8 million metric tons, and crude steel production decreased nearly 2 percent, to 11.0 million tons, compared with production levels in 1970.

Seventeen companies produced iron ore or byproduct iron at 18 locations, 10 of which were in Ontario, three in British Columbia, two in Quebec, two in Newfoundland (Labrador), and one in Quebec-Labrador. Shipments by Iron Ore Company of Canada Ltd. (IOC), the largest Canadian producer, from mines in Quebec and Labrador totaled 17.5 million metric tons, comprising 6.0 million tons of direct shipping ore, 9.6 million tons of pellets and 1.9 million tons of concentrates. Quebec Cartier Mining Co., Canada's second largest producer, shipped 8.1 million tons of concentrate, 0.9 million tons less than in 1970. Wabush Mines increased shipments of pellets 0.2 million tons, to 5.8 million tons, following modifications to its regrind mill which brought production up to rated capacity. Inco increased its production of byproduct iron from the treatment of pyrrhotite concentrates and shipped about 802,000 metric tons of pellets, 124,000 tons more than in 1970.

Newfoundland, the leading ore-producing Province, shipped 20.5 million metric tons of iron ore and accounted for nearly 47 percent of Canada's total shipments followed by Quebec with 26 percent and Ontario with 23 percent of the total. Imports of iron ore, nearly all from the United States, totaled approximately 1.2 million tons, compared with 2.1 million tons in 1970. Exports of iron ore declined 5.4 million tons, to 34 million tons. About 60 percent of the total ore exports went to the United States, 14 percent to the United Kingdom, 9 percent to Japan, and the remaining 17 percent was shipped to eight other countries.

Significant developments during the year included three major projects in Quebec under construction: A 10-million-ton-per-year expansion of the IOC concentrator at Labrador City to be in production late in 1972; a new IOC 6-million-ton-per-year concentrator and pellet plant at Sept Isles, Quebec, scheduled to start production in 1972; and a new 16-million-ton-per-year concentrator at Mt. Wright, Quebec, by Quebec Cartier Mining Co. scheduled for startup in 1974, which will have a capacity to treat 40 million tons of ore averaging 32 percent iron to recover 16 million tons of concentrate grading 66 percent iron.

The 300,000-ton-per-year byproduct iron oxide plant of Falconbridge Nickel Mines, Ltd. began tuneup operations. Completion of Inco's 250,000-ton-per-year expansion of its pellet plant was deferred because of economic and environmental factors.

Crude steel production comprising ingots and castings decreased 0.2 million tons from the record high level of 11.2 million tons in 1970. Imports increased 28 percent to 2.5 million tons exceeding exports by 0.5 million tons. Indicated consumption of crude steel increased nearly 0.5 million tons, to 11.5 million tons.

Algoma Steel Corp., Ltd., completed its $70-million 160-inch plate mill and began production. The corporation's basic oxygen steel plant under construction in 1971 is expected to be in production by early 1973. Dominion Foundries & Steel, Ltd. (Dofasco), started its new blast furnace and coking ovens early in 1971. The new facilities and plant modifications were expected to augment steel capacity about 0.6 million tons per year, to 2.9 million tons. The Steel Company of Canada Ltd. (STELCO) completed construction of its new tinplate facility at its Hilton Works designed to produce 175,000 tons of tinplate per year. Other additions to the company's plate and rod mills were scheduled for completion by yearend 1973. Three basic oxygen steel units were completed late in the year and were scheduled for operation early in 1972.

Sydney Steel Corporation, the Crown Corporation, continued work on its $94 million modernization program to increase capacity 14 percent, to 1.25 million tons. The corporation's five open-hearth furnaces will be replaced by basic oxygen furnaces, and continuous casting facilities will replace ingot casting.

Domestic consumption of iron ore in iron and steel plants was estimated at 11.0

million tons in 1971, about 0.3 million tons less than in 1970. The decline in ore use roughly paralleled the decline in output of crude steel. The lower ore production was attributed mainly to blast furnace problems at three Ontario plants rather than to a decline in demand. Domestic iron ore shipments plus imports exceeded consumption by 0.4 million tons. Shipments of rolled steel products to domestic consumers totaled 7.3 million tons in 1971, compared with 7.0 million tons in 1970. Canadian trade data for 1971 in metric tons (1970 data in parentheses) show: Imports of pig iron 608 (87); steel ingots and castings 52,526 (57,606); rolled products, including pipe, wire, and rail, 2,083,800 (1,437,300); exports of pig iron 498,500 (583,100); exports of steel ingots and castings 115,300 (126,600); exports of rolled products, including pipe, wire, and rail, 1,387,000 (1,482,000).

Lead and Zinc.—Mine output of lead and zinc contained in domestic ores and concentrates reached new highs, 10 percent and 1.4 percent, respectively, above figures recorded in 1970. However, refined output of both metals declined 9 percent and 11 percent, respectively, below output levels of 1970. Most of the increase in lead production was attributed to expanded operations by Anvil Mining Corp., Ltd., in the Yukon Territory and to greater output by Brunswick Mining and Smelting Corp., Ltd., in New Brunswick. The increase in zinc production also came mainly from the Anvil operations and from mines in Ontario. Canada ranked fourth among the world's lead-producing countries and retained its first rank in zinc production. According to the Department of Energy, Mines, and Resources, 24 companies accounted for virtually all of Canada's lead production while 40 were credited with zinc. Many of these companies produce both metals as well as other metals as byproducts or coproducts. On a geographical basis, the percentage distribution of lead and zinc (the latter in parentheses) in 1971 was as follows: Newfoundland and Nova Scotia, 2.5 (1.2) percent; New Brunswick, 17.5 (13.0) percent; Quebec, 0.1 (15.5) percent; Ontario, 2.3 (30.9) percent; Manitoba and Saskatchewan, 0.04 (2.7) percent; British Columbia, 30.4 (12.2) percent; Yukon Territory, 26.6 (9.3) percent; and Northwest Territories, 20.5 (15.2) percent.

A 64-percent gain in lead output in the Yukon Territory which came mainly from Anvil Mining Corp.'s operation at Faro more than offset a 30-percent loss in production at the Pine Point Mines operations of Cominco, Ltd., in the Northwest Territories which was attributed mainly to the lower grade of ore treated. Similarly, a 48-percent gain in zinc output by Anvil Mining offset most of the loss in zinc output by Pine Point Mines. Cominco's two mines —the Sullivan and Bluebell—contributed most of British Columbia's output of lead and zinc. Cominco's smelters and refineries at Trail treat concentrates from several custom sources in addition to concentrates from company-operated mines. Cominco announced the closing of its Bluebell lead-zinc mine scheduled to begin near yearend. Columbia Metals Corp. began tuneup operations in July at its 125-ton-per-day silver-lead-zinc property near Ferguson, British Columbia. Average grade of indicated ore is 6 percent lead, 6.7 percent zinc, and 6.9 ounces of silver per ton. Brunswick Mining and Smelting Corp., controlled by Noranda Mines, accounted for most of the lead and zinc output of New Brunswick. Brunswick's No. 6 mill was converted from producing a bulk lead-zinc concentrate to produce separate lead and zinc concentrates. Subsequently, work was begun near yearend on converting the Imperial Smelting Process (ISP) lead-zinc smelter at Belledune to a smelter processing lead concentrates only. The output of the ISP smelter during the first 9 months of 1971 was 31,000 tons of refined zinc and 16,000 tons of refined lead. The smelter changeover will permit the company to produce more lead at lower cost. The zinc concentrate formerly smelted at Belledune will be shipped to foreign smelters. Two zinc-lead mines—Copperline in British Columbia and Venus in the Yukon Territory —closed. The Delbridge zinc mine in Quebec also closed during the year. Labor strikes reduced output at the mines and smelter of Hudson Bay Mines and Smelting Co., Ltd. and at the Buchans mine in Newfoundland.

Ecstall Mining, Ltd., continued construction of an electrolytic zinc plant, a cadmium plant, and a sulfuric acid plant adjacent to its Kidd Creek concentrator near Timmins, Ontario. Production is scheduled to begin in April 1972 at an annual rate of 110,000 tons of refined zinc, 210,000 tons of sulfuric acid, and 450 tons of cadmium. Sherritt-Gordon Mines, Ltd., continued construction and development at its Ruttan zinc-copper mine in Manitoba in preparation for production scheduled to begin in mid-1973 at an estimated annual rate of 110,000 tons of 50-percent zinc concentrate and 160,000 tons of 25-percent copper concentrate. Hudson Bay Mining and Smelting Co., Ltd., continued to develop the Ghost Lake and White Lake zinc-copper mines in Manitoba scheduled for production in 1972.

Consumption of primary refined lead in 1971 was estimated at 51,600 metric tons. Shipments of zinc to domestic consumers totaled about 110,800 metric tons. Exports of lead in concentrates totaled 180,800 tons of which about 107,300 tons went to Japan, 28,300 tons to West Germany, and the remainder to the United States and Belgium-Luxembourg. Lead metal exports totaled 124,200 tons. The principal markets were the United States, United Kingdom, and India, accounting for about 91 percent of the total. Zinc exports increased to 1,069,100 tons including 213,500 tons in concentrates and 143,600 tons in refined metal to the United States. About 240,200 tons in ores and concentrates went to Belgium-Luxembourg and 138,900 tons to Japan.

Molybdenum.—Reversing the growth pattern of recent years, Canada's output of molybdenum declined about 21 percent in 1971. However, Canada maintained its rank as the world's second largest producer of molybdenum supplying approximately 18 percent of the estimated non-Communist world production.

Endako Mines, Ltd., a subsidiary of Placer Development, Ltd., Canada's leading molybdenum producer, treated 8.2 million metric tons of ore to produce a total of 14.4 million pounds in molybdenite concentrate and 9.2 million pounds in molybdic oxide. Because of a large buildup in inventories, molybdenum production was reduced 25 percent in August. The company reported minable ore reserves at yearend totaling 17.7 million metric tons, averaging 0.143 percent MoS_2 in the Endako pit, and 4.9 million tons, averaging 0.232 percent MoS_2 in the Denak pit.

Brenda Mines, Ltd., in British Columbia, completed its first full year's production at the design rate of 22,000 metric tons of copper-molybdenum ore per day. Grade of ore milled was 0.21 percent copper and 0.061 percent molybdenum. An inventory buildup to 6.6 million pounds of molybdenum in concentrates at the end of September was reported because of a decline in sales. Ore reserves at the beginning of the year were estimated at 150 million metric tons, averaging 0.182 percent copper and 0.049 percent molybdenum. Utah International began tuneup operations at its copper-molybdenum mine near Port Hardy on Vancouver Island in October. The open-cut mine and concentrator were scheduled for full-scale production by February 1, 1972, at the rate of 33,000 tons of ore per day. Annual output was estimated at about 49,000 metric tons of copper and 1.9 million pounds of molybdenum. Capital investment was estimated at $74 million.

Noranda Mines, suspended operations at its Boss Mountain mine in December because of reduced demand for molybdenum by European and Japanese steel producers. Ore reserves were estimated at 2.5 million tons averaging 0.23 percent molybdenum. Molybdenite Corporation of Canada, Ltd., suspended operations at its mine and concentrator in Quebec early in the year.

Lornex Mining Corp. continued preparation of its copper-molybdenum mine near Ashcroft, British Columbia, for production scheduled to start by mid-1972. Ore reserves were estimated at 266 million metric tons, averaging 0.427 percent copper and 0.014 percent molybdenum. Plant facilities have a designed capacity of 34,000 metric tons and will require an investment estimated at $138 million.

Nickel.—Reflecting an oversupply situation brought about by expanded productive capacity and a decline in the rate of world consumption, Canada's output of nickel in 1971 was reduced to 266,664 metric tons valued at $800.0 million, about 10,800 tons less than the record production in 1970.

Seven new nickel and nickel-copper mines were brought into production in 1971. Inco, the leading nickel-producing company, opened three mines in the Sudbury district of Ontario—Coleman, Copper Cliff South, and Little Stobie—and the Pipe and Soab mines in the Thompson area of Manitoba. Falconbridge Nickel opened the Manibridge mine in Manitoba, and Texmont Mines, Ltd., began production of nickel and copper in the Timmins area of Ontario.

Inco began to reduce output in the second half of the year as it became obvious that the expanded supply was outstripping demand. Operations were suspended at the Murray mine in the Sudbury area and the Soab mine at Thompson in September. Additional cutbacks in October reduced Inco's total production by about 22 percent.

In addition to the new mines opened, Inco completed its new 35,000-ton-per-day Clarabelle mill and continued construction of its new Copper Cliff nickel refinery which will have a capacity of 56,300 metric tons of nickel per year. The refinery is scheduled for completion in 1972. Other new productive facilities planned by Inco and scheduled for completion between 1972 and 1975 include new mines at Sudbury and Shebandowan, Ontario, expansion at the Port Colborne refinery, and expansion of byproduct facilities at Copper Cliff.

Falconbridge continued to develop two new mines at Sudbury and one in Manitoba and announced plans for construction of a refinery at Becancour, Quebec. The new refinery will have an annual capacity of 15,000 tons of nickel and 11,000 tons of copper with byproducts of cobalt and sulfur. The company also announced late in the year that its 500,000-ton-per-year iron-nickel refinery at Sudbury was in continuous operation.

Twenty-three nickel-copper mines in Ontario accounted for 77 percent of Canada's nickel production in 1971. Except for Texmont mines at Timmins, all of Ontario's production came from the Sudbury district where Inco operated 14 mines and Falconbridge eight mines. Manitoba accounted for 25 percent of the national total with most of the production from Inco's Thompson and Birchtree mines. Sherritt Gordon Mines, Ltd., mine at Lynn Lake produced about 8 percent of the Province's total.

Annual reports of the three integrated companies disclosed the following data on shipments and ore reserves:

	1970 r	1971
Nickel production (deliveries), in metric tons:		
Inco	235,358	155,334
Falconbridge	38,661	38,948
Sherritt Gordon	16,292	15,019
Ore reserves, in million metric tons:		
Inco	347.7	351.1
Falconbridge	88.4	90.6
Sherritt Gordon	11.4	9.1

r Revised.

Producer quotations for electrolytic nickel were essentially stable during the year at 137.5 cents per pound f.o.b. refineries at Port Colborne and Thorold, Ontario.

Silver.—Canada's mine production of silver in 1971 increased 1.7 million ounces to 45.9 million ounces, an alltime record. Canada again attained first rank among the world's silver-producing countries. The production gain in 1971 was attributed mainly to greater output at several base metal mines producing silver as a byproduct, particularly at the Anvil Mining lead-zinc mine in the Yukon Territory, which more than offset lower output from the silver-cobalt mines in the Cobalt-Gowganda area of northern Ontario.

Refinery output of silver dropped sharply in 1971 because of curtailed operations at the Kam-Kotia refinery at Cobalt which terminated mine shipments at the end of March and closed down later in the year.

On a geographical basis, Ontario accounted for about 39 percent of the total silver produced; British Columbia, 17 percent; Yukon Territory, 13 percent; Quebec, 12 percent; New Brunswick, 11 percent; and virtually all of the remaining 8 percent came from four other Provinces and the Northwest Territories. Production gains in the Yukon Territory, British Columbia, Quebec, and New Brunswick more than offset losses in Ontario, Northwest Territories, Newfoundland, and Saskatchewan.

Exports of refined silver in 1971 totaled 18.2 million ounces of which 92 percent was shipped to the United States compared with total shipments of 24.2 million ounces in 1970. In addition, Canada exported 25.2 million ounces in ores and concentrates, most of which was consigned to smelters in the United States. Imports of refined silver, mainly from the United States, totaled 0.7 million ounces compared with 4.3 million ounces in 1970.

Ecstall Mining, Ltd., Canada's largest silver producer, recovered 12.7 million ounces of byproduct silver from copper, lead, and zinc concentrates produced at its Kidd Creek mine operations near Timmins, Ontario. Cominco, the country's second largest producer, reported that it recovered 5.6 million ounces of byproduct silver from smelting and refining lead-zinc ores from its Sullivan and Bluebell mines in British Columbia and from purchased ores and concentrates. About 60 percent of the total came from company-owned mines.

Uranium.—Canada's uranium mining industry continued to be depressed in 1971 because of world overproduction and low metal prices. Mine output was estimated at 3,638 metric tons, slightly less than in 1970. About 85 percent of the total output came from mines of Rio Algom Mines, Ltd., and Denison Mines, Ltd., in the Elliot Lake area of Ontario. The remaining 15 percent came from the Eldorado Nuclear, Ltd., mine near Uranium City, Saskatchewan. Because of the low level of demand and oversupply situation, uranium exploration generally has declined with very little new activity reported.

Denison Mines continued to operate at about 4,000 tons per day, approximately two-thirds of its rated capacity. Steps were taken to improve mine and mill efficiency and to begin engineering design to increase production capacity in the post-1975 period. Rio Algom operated its Quirke mill at full capacity of 4,500 tons of ore per day and expanded its mine production to 6,500 tons per day at yearend. Eldorado Nuclear reduced production at its 2,000-ton-per-day mill about 50 percent and improved metallurgical efficiency. Productive operations were begun at the new Hab mine. Gulf Minerals Canada completed site preparation and continued design of its surface plant at Wollaston Lake, Saskatchewan, prior to starting construction early in 1972. Productive operations are scheduled to begin at a rate of 2,000 tons of ore per day in 1975.

The Atomic Energy Control Board issued only two new uranium exploration permits compared with 17 in 1970 and 82 in 1969. The decline in uranium exploration reflected the unfavorable short-term market outlook and uncertainty concerning the Government's pending ownership requirements.

Denison Mines, Ltd., began deliveries at midyear under terms of its joint-venture agreement with the Federal Government, which provides for Denison to deliver 2 million pounds of U_3O_8 each year from 1971 to 1973 and up to 467,000 pounds in 1974. The Government will pay Denison approximately $4.65 per pound with total government expenditure not to exceed $29.5 million. The net proceeds from the sale of the stockpiled material will be prorated up to the amount of respective contributions with remaining net revenues to be shared equally. The agreement was expected to help stabilize the economy in the Elliot Lake community until 1975 when long-term sales contracts can become effective.

NONMETALS

Asbestos.—Canadian production of chrysotile asbestos in 1971 was 1.48 million tons valued at $210.4 million, compared with 1.51 million, tons valued at $208.1 million in 1970. Nine mines in Quebec accounted for 81 percent of the total production; one mine in the Yukon Territory produced 6 percent, one mine in British Columbia and one in Newfoundland produced 5 percent each; and the remaining 3 percent of the national total came from two mines in Ontario.

Reflecting continued strong demand for fiber, Canadian producers spent over $200 million on new projects to develop new ore and to expand production facilities.

Canadian Johns-Manville continued to expand mining and milling facilities at its Jeffrey mine at Asbestos, Quebec, to increase production by approximately 90,000 metric tons of fiber per year by 1974. About one-third of the increase will be short fiber recovered from pre-1930 tailings. The expansion project when completed will ensure production of at least 544,000 tons of fiber per year. Asbestos Corp., Ltd., completed expansion of productive facilities at the King Beaver mine which will increase capacity from 7,300 to 11,300 metric tons of ore per day. Development of the Penhale ore body adjacent to the producing Normandie mine at Black Lake, Quebec, continued in preparation for scheduled production early in 1972 at a rate of 7,400 tons per day. Asbestos Corp. plans to start production at its Asbestos Hill mine in Ungava by mid-1972 at a rate of about 270,000 tons of concentrate per year. The concentrate will be shipped to West Germany for reduction to 90,000 tons of standard-grade fiber. Bell Asbestos Mines, Ltd., continued to modernize and increase the productive capacity of its facilities at Thetford Mines. Lake Asbestos of Quebec, Ltd., increased capacity of its milling plant at Black Lake from 5,400 to 8,100 tons of ore per day. Flintkote Mines, Ltd., closed its operations at Thetford mines at yearend.

Advocate Mines, Ltd. the only asbestos producer in Newfoundland, increased production 15 percent. In British Columbia, Cassiar Asbestos Corp. Ltd. completed expansion of its mill which will increase production capacity about 36,000 tons, to 110,000 tons of fiber per year. Cassiar also has scheduled a 20-percent increase in production to 110,000 metric tons per year at its Clinton Creek mine in the Yukon Territory. McAdam Mining Corp. reported a reserve of 95 million tons minable by open pit at its Chibougamau, Quebec, property. Allied Mining Corp. was evaluating the production potential of its asbestos prospect near Timmins, Ontario, where a reserve of 142 million tons averaging 9 percent fiber was reported. Feasibility studies indicate that a plant treating 4,500 tons of ore per day could produce initially 90,000 tons of fiber per year.

About 95 percent of Canada's production of asbestos was exported in 1971. The United States received 601,900 metric tons or about 40 percent of the total fiber production. Among other principal destinations, Japan received 99,000 tons; United Kingdom, 97,000 tons; West Germany, 80,000 tons; France, 67,000 tons. Canada supplied 95 percent of United States imports of asbestos in 1971, representing about 86 percent of U.S. consumption.

Potash.—The continued use of production and marketing controls established by the Saskatchewan Government in 1970 maintained a relative balance between world supply and demand in 1971. The balance was achieved despite excess productive capacity and continued strong demand through a basic quota of 40 percent of rated productive capacity of each mine. The minimum price of Can$0.3375 per unit of K_2O equivalent, established in 1970 to stabilize North American and World potash prices, was effective in 1971 as sales in the first 10 months averaged $0.3709 per unit of K_2O equivalent compared with an average of $0.3178 in 1970. Canadian potash shipments increased in 1971 to 3.51 million tons K_2O equivalent valued at Can$128.1 million from 3.10 million tons valued at $108.7 million in 1970. Output from the eight operating mines in Saskatchewan averaged 43 percent of the industry's designed capacity. Two mines were shut down for extensive repairs and rehabilitation.

Cominco, reported good progress in the rehabilitation of the Vade potash mine at Vanscoy, Saskatchewan, which was flooded in August 1970. Water flows were sealed, and the mine was completely dewatered. Underground equipment was being restored, and production will be resumed in the latter part of 1972.

Hudson Bay Mining and Smelting Co., Ltd., reported that its Sylvite of Canada, Ltd. division treated 1.33 million metric tons of ore and produced 455,200 tons of muriate of potash in its first full year of operation at its potash mine at Rocanville, Saskatchewan.

Sulfur.—Canadian production of sulfur in all forms was estimated at 5.3 million metric tons, of which about 4.6 million tons was in elemental form, a 10-percent increase over estimated 1970 total production.[3] Because of the continued world oversupply situation, Canada's exports of sulfur decreased 17 percent and its sulfur stockpile increased about 2 million tons, to 5.5 million metric tons.

The continued growth in Canada's sulfur production was attributed to increased involuntary recovery as a byproduct from the treatment of sour natural gas, principally in Alberta. In 1971, 40 sulfur recovery plants were operating with a combined capacity of 9.3 million metric tons per year.

Canada's sulfur exports declined in 1971, the first time since 1966, and Canada's share of the total world market for elemental sulfur decreased from 34 percent in 1970 to 26 percent in 1971. Poland appears to have surpassed Canada as the leading exporter to world markets.

Reflecting the substantial growth in output of sulfur, particularly in Poland and Canada, and lower demand in the fertilizer industry, prices in 1971 declined to an all-time low averaging $7.50 per ton. No near-term improvement in price was expected in view of growing inventories and Canada's deteriorating competitive position.

Canada's consumption of sulfur in 1970 was estimated at 1.42 million metric tons distributed according to the industry pattern of 1969: Pulp and paper, 54 percent; chemicals, 23 percent; fertilizers, 19 percent; and 4 percent to rubber, foundry, and other various other products. Exports of crude and refined sulfur totaled 2,402,000 metric tons valued at $27.1 million. Principal destinations were United States, 915,000 tons; Belgium-Luxembourg, 259,000 tons; Australia, 224,000 tons; New Zealand, 155,000 tons; and India, 150,000 tons.

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[3] Figures presented here are Canadian Government estimates of total output and differ from shipment figures presented in table 1.

MINERAL FUELS

Coal.—Canada's production of all types of coal—bituminous, subbituminous, and lignite—increased 11 percent to 16.7 million metric tons, a new record. The value of production in 1971 was estimated at $121 million, 42 percent more than in 1970. Exports to Japan increased 70 percent, to about 6.8 million tons. Production gains in British Columbia, Alberta, and New Brunswick aggregating 33 percent more than offset the 13-percent loss in Saskachewan's and Nova Scotia's combined output.

After beginning production in 1970, Kaiser Resources continued to have startup difficulties at its Sparwood open pit mine and preparation plant in British Columbia, which required extensive modifications and additional capital expenditures of about $30 million. Because of the production delays, Kaiser negotiated a new agreement with Japanese interests providing for shipment of 4.4 million long tons (4.5 million metric tons) during the fiscal year 1971–72 adjusted period. The new agreement also provided for a price increase to $18.65 per long ton ($18.36 per metric ton). Kaiser reported considerable progress in tests at its experimental underground hydraulic mine which may ultimately produce 500,000 tons of coking coal per year.

Fording Coal, Ltd., continued construction and development work at its surface coal mine in British Columbia in preparation for the scheduled start of operations by April 1, 1972. The company plans to produce 2.5 million tons of coking coal during the first year of operation and 3 million tons annually for the remainder of its 15-year contract with Japanese steel companies. Several large companies continued exploration for coal in British Columbia, particularly at the Sukunka and Quintette properties in the northeastern part of the Province. Similarly, at properties in southeastern British Columbia, mining feasibility studies were in progress.

Twenty coal mines in Alberta produced subbituminous coal for local markets in 1971, and four mines produced coking coal. McIntyre Porcupine Mines, Ltd., experienced startup difficulties at its underground coal operations at Grande Cache which reduced its coal shipments to Japan below contract requirements. The company changed its mining system from long-wall to room-and-pillar in an effort to improve production but had to develop its surface mine to provide the additional coal to meet its contract commitments of 2 million tons annually to Japan. McIntyre signed a tentative second contract in March to deliver 45.7 million long tons (46.4 metric tons) to Japanese steel interests. Cardinal River Coals, Ltd., Luscar, Alberta, shipped about 1 million tons of coking coal to Japan in 1971 and announced tentative plans to increase output to 1.5 million tons. Coleman Collieries, Ltd., produced 870,000 metric tons of coking coal and is expanding its surface and underground facilities to produce 1.5 million tons annually beginning in 1972, based on signed contracts with Japanese interests. Alberta Coal, Ltd., produced about 1.1 million tons per year from its Highvale mine at Lake Wabamun for Calgary Power, Ltd.'s, Sundance power station. The company plans to double the present 1.2-million-ton-per-year mine capacity as new units are added at the Sundance plant.

The Cape Breton Development Corp. operated five mines in Nova Scotia, accounting for nearly all of the Province's coal output of approximately 1.76 million metric tons in 1971. The corporation closed one mine and began phasing out another. A new mine at Lingan was being developed with production scheduled for 1974.

Canada's national coal balance for recent years is summarized as follows:

	Quantity (million metric tons)		
	1969	1970[r]	1971[e]
Production	9.7	15.1	16.7
Imports:			
Anthracite	.4	.4	.4
Bituminous	15.1	16.7	16.0
Total supply	25.2	32.2	33.1
Consumption	23.9	28.2	25.8
Exports	1.3	4.0	7.0

[e] Estimate. [r] Revised.

Source: Canada Dept. of Energy, Mines & Resources and Statistics Canada.

According to data compiled by Statistics Canada, total production of bituminous, subbituminous and lignite in 1971 was 16.7 million metric tons. Consumption and exports totaled 32.8 million tons. Of the 25.8

million tons consumed in Canada, 60 percent was used by electric utilities, 9 percent by mining and manufacturing, 26 percent for coke production and 5 percent for railways, ships, domestic sales and other uses. Imports were all from the United States. Of the 7 million tons of exports 6.7 million tons went to Japan.

Petroleum and Natural Gas.—Canadian production of crude oil and natural gas liquids again achieved record levels in response to continued growth in market demand. Average production of crude oil and natural gas liquids (excluding gas liquid output returned to formations) increased to 1.58 million barrels per day, a gain of 106,000 barrels per day or 7.2 percent compared with a 12.8 percent increase of 168,000 barrels per day in 1970. Net withdrawals of natural gas increased 10.3 percent, to 6,880 million cubic feet per day compared with the 1970 increase of 15.1 percent. Total value of oil and gas production was estimated at $1,892 million, 14.4 percent more than the 1970 value. The combined production of Alberta and Saskatchewan accounted for 93 percent of the total crude oil output in 1971; British Columbia contributed about 5 percent; and the remaining 2 percent came from Manitoba, Ontario, and the Northwest Territories.

Exploration and development activity in the major established producing regions of western Canada in terms of the number of oil and gas well completions decreased about 5 percent. Alberta continued to be the most active Province with well completions up 10 percent to 1,980, but total footage was little more than in 1970; however, in Saskatchewan, well completions dropped 25 percent to 624 during 1971. The reduced activity in producing areas mainly reflected a lack of major discoveries and a shift in exploratory expenditures to frontier areas in the far-northern Arctic where drilling and operating costs are much greater.

Significant oil and gas discoveries, which may lead to large-scale development, were made in both the Arctic mainland and in the unexplored Arctic islands. In the Mackenzie River Delta region two wells drilled southwest of the original discovery of last year at Atkinson Point uncovered oil and gas. Several major oil companies were active in drilling exploration at locations on 17 different islands in the Arctic Archipelago. A new gas discovery was reported on Ellef Ringnes Island and further drilling 2 miles north of the gas discovery made last year on King Christian Island indicated an extension of this producing reservoir. Extensive further explorations of the first gas discoveries continued, particularly on land held by Panarctic Oils, Ltd., the government-industry consortium, to establish the extent of reserves. Comprehensive studies were begun to determine the technologic and economic feasibility of pipeline transportation. The first significant oil and gas discovery off Canada's east coast was made on Sable Island. Further drilling was underway to evaluate the size of the discovery. Renewed interest in developing Canada's nonconventional crude oil reserves in bituminous sands was based on increased long-term demand and anticipated crude oil price increases. Great Canadian Oil Sand, Ltd., improved the efficiency and output of its 45,000-barrel-per-day recovery plant at Fort McMurray, Alberta, through modifications and new equipment. Syncrude Canada, Ltd., increased the design capacity of its new recovery plant from 80,000 to 125,000 barrels per day in anticipation of increased market demand when the plant goes onstream in 1976.

Exports of crude oil to the United States increased nearly 12 percent to 738,000 barrels per day and accounted for 51 percent of total Canadian shipments in 1971 compared with 48 percent in 1970. Total exports of crude petroleum in 1971 were 270.8 million barrels valued at $786.8 million. Canada's self-sufficiency in oil increased significantly in recent years reaching about 98 percent in 1971. Total consumption of oil reached 1.53 million barrels per day. Natural gas exports to the United States increased 17 percent to 2,496 million cubic feet per day. Total natural gas exports amounted to 903.0 billion cubic feet valued at $250.7 million. Gas sales to Canadian consumers were up 11 percent. Applications to increase exports to 2,700 million cubic feet per day over the next 15 years was rejected by the National Energy Board (NEB), which determined that no surplus gas was available for export after providing for future Canadian gas requirements. The NEB determination excluded all new gas reserves not readily accessible to pipeline such as recent discoveries in the Arctic region.

The Mineral Industry of Chile

By Lyman Moore [1]

Nationalization of mineral industries overshadowed commercial and technical developments during 1971.

On December 22, 1970, a constitutional amendment was introduced in the Chilean legislature giving the National Government complete power over mineral resources, including authority to nationalize privately owned or combined government- and privately owned mineral concessions and processing facilities. The amendment passed the Chamber of Deputies and the Senate in May; after an obligatory 60-day reconsideration period it was ratified by joint legislative action on July 11, 1971, and became effective July 16, 1971.

The amendment provided that, in the case of companies classified as large mines, nationalization could include the company itself, its activities, and all or part of its assets. Also included in the nationalization were activities of other companies or organizations that are essential for operating mining properties. The Government was empowered to take physical possession of nationalized property immediately after the effective date of the law. Persons affected by nationalization were allowed to take legal action against the Government only to assert their right to compensation that had been determined by the Government. The rights of shareholders of companies nationalized were limited to receiving their proportionate share of compensation received by the company. Contracts or agreements between the Government or its agencies maintaining exceptional legal systems or special administrative treatment in favor of private parties could be modified or terminated as the national interest requires.

Compensation for nationalized property was to be determined on the basis of original cost, less amortization, depreciation, and obsolescence. All or part of any profits obtained since 1955 by the nationalized company and considered to be excessive could be deducted from the compensation. Payment for nationalized property was to be in legal tender over a period not exceeding 30 years.

A special section of the amendment provided for immediate nationalization of large copper mines upon ratification of the act.

PRODUCTION

Overall mineral production increased moderately in 1971 despite the unsettling effects of nationalization. Mine output of copper increased 1 percent, iron ore production was essentially unchanged, cement increased 2 percent, sodium nitrate 25 percent, potassium nitrate 18 percent, iodine 18 percent, coal 7 percent, natural gas 5 percent, and petroleum 4 percent. The value of mineral production decreased during the year because of lower copper prices. There was considerable loss of production at some plants due to massive changes of supervisory personnel but these losses were compensated for by production from new facilities coming onstream in 1971. Substantial new copper production was made by the Rio Blanco mine of Companía Minera Andina, S.A., and the Exótica mine of Companía Minera Exótica, S.A. Production of petroleum refinery products and of natural gas liquids increased considerably because of plant enlargements.

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[1] Mining engineer, Division of Nonferrous Metals.

Table 1.—Chile: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1969	1970	1971 [p]
METALS			
Copper:			
Mine output, metal content [2]	699,071	710,681	717,502
Metal, copper content:			
Smelter [3]	661,788	658,206	639,808
Refined:[4]			
Fire	95,819	93,232	74,711
Electrolytic	355,477	366,590	366,634
Gold mine output, metal content ... troy ounces	58,736	52,177	64,417
Iron and steel:			
Iron ore and concentrate ... thousand tons	11,534	11,265	11,228
Pig iron ... do	485	481	500
Ferroalloys ... do	12	12	[e] 12
Crude steel [5] ... do	[r] 641	592	[e] 600
Semimanufactures (hot rolled) ... do	504	436	NA
Lead mine output, metal content	832	892	880
Manganese ore and concentrate	23,699	26,723	23,838
Mercury ... 76-pound flasks	286	388	502
Molybdenum mine output, metal content	4,841	5,701	6,321
Silver mine output, metal content ... thousand troy ounces	3,075	2,450	5,360
Zinc mine output, metal content	1,478	1,537	1,892
NONMETALS			
Barite	8,009	1,542	1,282
Cement, hydraulic ... thousand tons	1,436	1,372	1,404
Clays:			
Kaolin	44,428	47,265	42,123
Other (unspecified)	91,636	116,568	101,862
Feldspar	1,304	3,525	646
Fertilizer materials, crude:			
Nitrates:			
Sodium	656,939	515,615	642,097
Potassium, enriched	124,727	158,235	186,828
Phosphates, guano	15,269	14,894	13,075
Gem stones, lapis lazuli ... kilograms	3,151	7,800	6,090
Gypsum:			
Crude	125,038	153,263	152,424
Calcined	52,781	63,132	50,576
Iodine, elemental	2,449	2,223	2,622
Pigments, natural mineral, iron oxide	18,516	19,035	14,845
Pozzolan	175,215	161,944	145,840
Quartz:			
Common quartz	99,141	87,229	120,683
Glass sand	38,350	31,197	18,146
Salt, all types ... thousand tons	1,382	517	424
Stone not further described:			
Limestone ... do	2,304	2,409	2,419
Marble	2,400	1,923	1,999
Sulfates, sodium:			
Natural, mined	29,383	25,790	51,288
Anhydrous, coproduct of nitrate industry	47,618	41,210	
Sulfur:			
Native other than Frasch:			
Refined, sulfur content	46,717	47,134	32,385
Unrefined, sulfur content	51,943	61,487	73,103
Sulfur content of acid derived from pyrite and industrial gases	13,535	9,821	6,699
Talc	809	2,100	1,758
MINERAL FUELS AND RELATED MATERIALS			
Coal, bituminous and lignite ... thousand tons	1,704	1,510	1,623
Coke, coke oven ... do	317	[e] 320	[e] 320
Gas, natural:			
Gross production ... million cubic feet	263,790	269,405	282,034
Marketed ... do	79,952	94,280	126,252
Natural gas liquids, gross production:			
Condensate ... thousand 42-gallon barrels	1,185	1,087	1,220
Natural gasoline ... do	444	395	681
Liquefied petroleum gases [6] ... do	1,408	1,288	1,812
Petroleum:			
Crude ... do	13,350	12,432	12,882
Refinery products:[7]			
Aviation gasoline ... do	225	183	97
Motor gasoline ... do	[r] 9,548	9,671	11,183
Jet fuel ... do	136	481	573
Kerosine ... do	2,543	2,727	3,562

See footnotes at end of table.

Table 1.—Chile: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity [1]	1969	1970	1971 p
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Refinery products [7] —Continued			
Distillate fuel oil thousand 42-gallon barrels	4,477	4,461	5,649
Residual fuel oil do	7,748	6,131	9,996
Liquefied petroleum gas do	1,973	1,503	5,468
Asphalt, refinery do	56	45	
Solvents do	26	24	
Other do	474	492	
Refinery fuel and losses do	r 1,514	1,493	
Total do	r 28,720	27,211	36,528

e Estimate. p Preliminary. r Revised. NA Not available.

[1] In addition to the commodities listed, borates, lime, pyrites, selenium, vanadiferous slag, and manufactured gas are produced but available information is inadequate to make reliable estimates of output levels.

[2] Data given are the nonduplicative copper content of ores, concentrates, precipitates, metal, and other copper-bearing products measured at the least stage of processing reported in available sources.

[3] Figures presented are total blister and equivalent copper output including that blister subsequently refined in Chile and copper which is produced by electrowinning. Material produced for refining at Ventanas smelter is included.

[4] Figures presented are total refined output, distributed into two classes according to method of refining; output of Ventanas refinery is included.

[5] Excluding castings.

[6] Data apparently represent net plant output for consumption, presumably excluding quantities reinjected, as follows in thousand 42-gallon barrels: 1969—20; 1970—60; 1971—15.

[7] Includes a relatively small quantity of products derived from natural gas.

TRADE

Customs data indicated that the value of Chile's exports of mineral commodities during 1970 was 14 percent more than in 1969 with larger shipments of most minerals. The value of nonmineral exports was also higher than in 1969. Imports of minerals increased 3 percent because of increased receipts of iron and steel products and of platinum and gold. Imports of nonmineral commodities were also up 3 percent. The net trade balances for both mineral commodities and all commodities were increased substantially from those of 1969.

Mineral commodities continued to dominate the countries export trade, accounting for about 89 percent of the total value. The customs value for all forms of unmanufactured copper and copper-bearing raw materials exported totaled $952.1 million[2] compared with a revised $813.6 million in 1969 and represented 77 percent of total exports.

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[2] Camara de Comercio de Santiago de Chile. Comercio Exterior, Chile, V. 2, 1969 and 1970. Where necessary, values have been converted from Chile Escudo (CEsc) to U.S. dollars at the rate of CEsc12.21=US$1.00.

	Value (million dollars)	
	1969	1970
Exports:		
Mineral commodities:		
Metals	r 923.3	1,073.0
Nonmetals	36.5	25.5
Mineral fuels	.7	.4
Total	r 960.5	1.098.9
All commodities	1,075.4	1,233.5
Imports:		
Mineral commodities:		
Metals	r 38.7	46.2
Nonmetals	r 34.8	34.3
Mineral fuels	65.5	62.3
Total	r 139.0	142.8
All commodities	907.1	930.8
Net trade balance:		
Mineral commodities	r +821.5	+956.1
All commodities	+168.3	+302.7

r Revised.

Table 2.—Chile: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum metal including alloys, all forms	13	26	All to Netherlands.
Copper:			
Ore and concentrate	12,399	24,997	Japan 12,839; West Germany 9,343; Sweden 1,483.
Precipitate	1,065	174	All to Japan.
Slag, ash and residues	227	105	All to Belgium-Luxembourg.
Copper sulfate	1,279	1,700	Brazil 1,250; Netherlands 167; United States 104.
Metal including alloys:			
Scrap	--	161	Japan 156; Peru 5.
Unwrought:			
Unrefined:			
Precipitates including cement	21,304	17,653	Japan 10,500; Spain 7,060; Belgium-Luxembourg 52.
Blister	[r]188,900	197,550	United States 88,689; Japan 31,119; United Kingdom 29,224.
Refined	374,843	426,030	Netherlands 95,461; United Kingdom 72,024; Italy 60,861; West Germany 52,855.
Semimanufactures	[r]36,519	38,827	Argentina 14,813; Netherlands 5,557; Brazil 4,430; Colombia 3,650.
Gold ore and concentrate	36,913	41,322	West Germany 14,765; Romania 10,411; Sweden 10,112.
Iron and steel:			
Ore and concentrate thousand tons	9,645	9,908	Japan 7,777; United States 1,326; West Germany 532.
Roasted pyrite	10,063	--	
Slag	18,252	25,858	United States 25,809; Japan 49.
Metal:			
Pig iron including cast iron	--	9,752	Japan 9,452; Belgium-Luxembourg 300.
Ferroalloys	1,090	1,802	United States 475; Republic of South Africa 370; Colombia 260.
Steel, primary forms	3,479	7,863	Ecuador 6,480; Brazil 1,383.
Semimanufactures	[r]2,195	3,276	Brazil 2,153; Peru 818.
Manganese:			
Ore and concentrate	1,709	3,307	West Germany 3,302; Spain 5.
Metal	1,332	--	
Mercury 76-pound flasks	--	3	All to Peru.
Molybdenum:			
Concentrate	2,736	5,623	Netherlands 1,702; Sweden 1,018; West Germany 1,013.
Oxide, all grades	1,240	2,089	Japan 1,243; Australia 561; Austria 79.
Nickel metal scrap	23	--	
Silver ore and concentrate	50,216	67,509	West Germany 47,620; Belgium-Luxembourg 11,382; Japan 8,507.
Zinc metal scrap, ash, residues	240	176	All to Belgium-Luxembourg.
Other:			
Ore and concentrate	18,057	714	Netherlands 235; United Kingdom 194; France 134.
Metal-bearing slag n.e.s	114	12	Japan 11; West Germany 1.
NONMETALS			
Boron materials, crude natural borate	96	65	All to Uruguay.
Cement	65,586	31,924	Argentina 31,206; Bolivia 718.
Fertilizer materials, crude natural nitrates:			
Sodium	462,288	374,418	United States 109,168; Netherlands 82,534; Spain 52,305.
Potassium enriched	75,517	77,562	United States 53,247; Brazil 9,164; Netherlands 8,930.
Iodine	2,603	2,245	United States 903; Netherlands 634; United Kingdom 173.
Precious and semiprecious stones kilograms	[r]8,625	16,341	West Germany 10,287; United States 5,000; Netherlands 743.
Salt	855,553	293,549	United States 168,674; Japan 110,145; Colombia 14,730.
Sulfur, elemental	100	1	All to United States.
Other nonmetals n.e.s value	$1,269	$50	Italy $30; West Germany $20.
MINERAL FUELS AND RELATED MATERIALS			
Coal	1,018	1,320	All to Bolivia.
Natural gas liquids thousand 42-gallon barrels	254	150	All to Argentina.
Other mineral fuels and related materials n.e.s value	$4,557	$5,181	United Kingdom $5,071; United States $110.

[r] Revised.

Source: Camara de Comercio de Santiago de Chile. Comercio Exterior, Chile. V. 2, 1969 and 1970.

Table 3.—Chile: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum:		
Bauxite and concentrate	2,033	1,557
Oxide (alumina) and hydroxide	407	285
Metal including alloys:		
Scrap	19	64
Unwrought	3,816	4,431
Semimanufactures	274	594
Antimony metal	140	30
Arsenic, trioxide, pentoxide, and acids	100	96
Cadmium metal	7	5
Chromium:		
Chromite	527	202
Oxides and hydroxides	43	60
Metal including alloys, all forms	(1)	3
Cobalt oxide and hydroxide	8	5
Copper metal including alloys, all forms	257	174
Gold metal unworked and partly worked troy ounces	7,443	19,385
Iron and steel:		
Scrap	3,719	7
Pig iron including spiegeleisen	624	1,122
Sponge iron, powder, and shot	320	406
Ferroalloys:		
Ferromanganese	--	1,031
Other	709	704
Ingots and other primary forms	26,729	55,977
Semimanufactures:		
Bars and rods	4,769	3,456
Angles, shapes, sections	9,244	16,925
Universals, plates, sheets	27,688	25,680
Hoop and strip	337	260
Rails and accessories	12,068	8,016
Wire	477	1,882
Tubes, pipes, fittings	r 19,693	16,996
Alloys and high carbon steel	10,541	11,662
Lead:		
Oxides	6	6
Metals including alloys:		
Scrap	177	29
Unwrought	2,414	2,754
Semimanufactures	697	134
Mercury 76-pound flasks	1	499
Nickel:		
Matte, speiss and similar materials	7	4
Metal including alloys, all forms	111	120
Platinum-group metals including alloys troy ounces	1,051	4,892
Selenium, elemental kilograms	458	500
Silver metal including alloys troy ounces	25,232	176,327
Tin:		
Oxides long tons	4	3
Metal including alloys do	720	951
Titanium oxides	2,845	2,619
Zinc metal including alloys:		
Scrap and blue powder	41	23
Unwrought	5,291	3,788
Semimanufactures	115	191
Zirconium:		
Ore and concentrate	714	428
Zirconium silicate	20	--
Other:		
Ore and concentrate value	r $10,210	$33,850
Ash and residue containing nonferrous metal do	$151,729	$76,528
Oxide, hydroxide and peroxides of metals do	$341,255	$80,555
Metals including alloys, all forms do	r $32,941	$35,869
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc	70	75
Dust and powder of precious and semiprecious stones value	$726	$1,950
Grinding and polishing wheels and stones	564	411
Asbestos	10,815	8,751
Barite and witherite	16	127
Cement	r 34,282	28,936
Chalk	2	1

See footnotes at end of table.

Table 3.—Chile: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970
NONMETALS—Continued		
Clays and products (including refractory bricks):		
Crude n.e.s.:		
Bentonite	3,701	4,153
Fuller's earth	12	113
Kaolin	411	484
Other	513	379
Products:		
Refractory (including nonclay bricks and cement)	18,933	16,515
Nonrefractory	40	83
Cryolite and chiolite	13	10
Diamond, industrial carats	18,050	22,228
Diatomite and other infusorial earths	408	825
Feldspar	20	16
Fertilizer materials crude and manufactured:		
Nitrogenous	r 48,798	78,411
Phosphatic	197,668	150,683
Potassic	r 49,834	48,119
Other including mixed	r 2,900	19,815
Ammonia	343	689
Fluorspar	2,966	1,334
Graphite, natural	98	165
Lime	50	40
Magnesite	2,823	2,132
Mica, all forms	114	57
Pigments, mineral including processed iron oxides	r 160	122
Salt	24	19
Sodium and potassium compounds n.e.s.:		
Caustic soda	r 17,787	14,072
Caustic potash, sodic and potassic peroxides	198	184
Stone, sand and gravel:		
Dimension stone	48	33
Dolomite	29,497	24,658
Other	r 234	151
Sulfur:		
Elemental, all forms	50,763	62,117
Sulfuric acid	21	11
Talc, steatite, soapstone, pyrophyllite	608	268
Other nonmetals:		
Oxides and hydroxides of magnesium, strontium, and barium	87	120
Other n.e.s	370	169
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	227	552
Carbon black and gas carbon	4,854	5,321
Coal, all grades including briquets	r 582,794	236,292
Coke and semicoke	61	15,271
Hydrogen, helium, and rare gases	134	109
Liquefied petroleum gas thousand 42-gallon barrels	r 209	802
Peat including peat briquets and litter	24	10
Petroleum:		
Crude thousand 42-gallon barrels	r 16,044	14,623
Refinery products:		
Gasoline do	192	703
Kerosine and jet fuel do	801	452
Distillate fuel oil do	563	490
Residual fuel oil do	1,326	2,943
Lubricants do	334	388
Mineral jelly and wax do	r 115	67
Other do	73	261
Mineral tar and crude chemicals from coal–, petroleum–, and natural gas	445	1,019

r Revised.

[1] Less than ½ unit.

Source: Camara de Comercio de Santiago de Chile. Comercio Exterior, Chile. V. 1, 1969 and 1970.

COMMODITY REVIEW

METALS

Copper.—The nationalization amendment provided that large copper mines should be immediately incorporated into the national domain, with the Government taking physical possession of the properties at such time as the President ordered.

Compensation for the property was to be determined by the Comptroller General within 90 days plus, if necessary, an additional 90 days, subject to the following regulations: Compensation was to be limited to the December 31, 1970, book value of plant and improvements less any revaluations of assets made subsequent to December 31, 1964. No compensation was to be allowed for mineral rights, all of which are considered to be the property of the Government. No compensation was to be paid for assets not in good operating condition or not having spare parts and rights to service and repairs. The President was empowered to determine the amount of excess profits, if any, obtained by the companies since 1955 and to order the Comptroller General to deduct such amounts from the compensation payments. Maximum allowable profitability for the purpose of determining excess profits could be considered the average return of the nationalized companies from all international operations, or the return rate used to determine preferential dividends to the Government during previous periods of high copper prices, or the rate agreed on between the Government and foreign companies in certain other operations. The Comptroller General's decision could be appealed within 15 days of publication to a special tribunal whose decision would be final.

Within 5 days of the final decision the President was to set the term, interest, and form of payment. The term could not be more than 30 years and the interest not less than 3 percent. Payment would be in legal tender unless the nationalized companies agree to another form of compensation.

Payments could be suspended for refusal to turn over operational data, prospecting reports, or other information needed for normal operation or for execution of future plans. Compensation payments could also be suspended for actions tending to alter the normal course of mining operation, or to affect expansion regardless of whether they are attributable to the nationalized company. The Treasury maintained the right to review all operations, imports, exports, documents, and account books of the copper companies to establish that all legal obligations of the companies were being complied with. Any balances found in favor of the Treasury were to be deducted from the compensation. Accounts receivable that were not paid when due were to be deducted from the next compensation payment. All debts owed to the Treasury, government agencies, or social security institutions could be withheld from compensation installments. The Government was not to assume any debts of the companies when in the opinion of the President the amounts involved were not usefully employed.

Following ratification of the amendment, decrees were issued, effective July 16, 1971, by the Ministry of Mines and signed by the President authorizing the Government to take physical possession of the mining properties of Chuquicamata, El Salvador, Exótica, Andina, and El Teniente. Commissions were appointed to manage each mine until permanent boards of directors were named.

The Comptroller General appointed commissions, including government inspectors and military and civilian engineers, for each of the nationalized mines to determine compensation due to owners. The President determined the excess profits obtained by the companies and announced the amounts September 28, 1971. They were as follows: Chuquicamata, $300.0 million; El Salvador, $64.0 million; and El Teniente, $410.0 million. Exótica and Andina commenced production too recently to have obtained excess profits. The Comptroller General's final determination of compensation due owners for their equities in the five mines nationalized were announced October 14, 1971. The amounts were Chuquicamata, minus $76.5 million; El Salvador, minus $1.6 million; Exótica, $10.0 million; Andina, $18.3 million; and El Teniente, minus $310.4 million. The judgments nullified the owners equity in Chuquicamata, El Salvador, and El Teniente.

The compensation payment determinations were appealed by the companies to the Special Copper Tribunal provided for by the Constitutional Amendment. The Government of Chile also filed an appeal asking for greater deduction from the book value of El Teniente. A final decision on the appeals is not expected until 1972.

Following is a summary of the compensation amounts determined by the Comptroller General (in million dollars):

Companía Minera Chuquicamata, S.A.:	
Book value Dec. 31, 1970	242.0
Deductions:	
Mineral rights	5.4
Defective assets	13.1
Excess profits	300.0
Total	318.5
Compensation due [1]	−76.5
Companía Minera El Salvador, S.A.:	
Book value Dec. 31, 1970	68.4
Deductions:	
Mineral rights	.4
Defective assets	5.6
Excess profits	64.0
Total	70.0
Compensation due [1]	−1.6
Companía Minera Exótica, S.A.:	
Book value Dec. 31, 1970	14.8
Deductions:	
Mineral rights	.3
Defective assets	4.5
Total	4.8
Compensation due [1]	10.0
Companía Minera Andina, S.A.:	
Book value Dec. 31, 1970	20.1
Deductions:	
Mineral rights	1.5
Defective assets	.3
Total	1.8
Compensation due [1]	18.3
Companía Minera El Teniente, S.A.:	
Book value Dec. 31, 1970	318.8
Deductions:	
Revaluations since Dec. 31, 1964	198.5
Mineral rights	.2
Defective assets	20.5
Excess profits	410.0
Total	629.2
Compensation due [1]	−310.4

[1] Calculated as book value minus total deductions.

On December 30, 1971, the President of Chile suspended payment on $5.8 million due to Kennecott Copper Corp.; this was to be the first payment on $92.9 million lent to El Teniente Mining Co. for expansion and was guaranteed by the Chilean Government. The Chilean Government maintains that the Constitutional Reform Bill gives the President the right to suspend payment pending his determination of whether the proceeds of the loan were usefully invested. On December 31, 1971, Corporación del Cobre failed to make payment on promissory notes held by The Anaconda Company. Both of these actions are being contested in Chilean and United States Courts.

Nationalization hampered copper production at the affected properties mainly because of massive changes of supervisory and technical employees.

In 1971 Chuquicamata produced 192,298 tons of electrolytic copper and 56,297 tons of blister copper, a 6-percent decrease compared with the 207,201 tons of electrolytic copper and 57,811 tons of blister produced in 1970. Some production loss resulted from a 7-day strike in August by supervisors and technicians. Fifteen of the strikers, including the President of the Copper Supervisors' Association, were arrested under provisions of the Internal Security Act.

El Salvador produced 59,805 tons of electrolytic copper and 24,067 tons of blister, about 10 percent less than the 69,475 tons of electrolytic copper and 23,610 tons of blister produced in 1970. Production was halted from August 1 to 12 by a strike of the 4,500 employees over wage rates. The settlement provided for a 40.5-percent increase.

Production at Exótica during 1971, the first full year of operation, was 35,260 tons of electrolytic copper, about one-half the design capacity. Daily mill throughput reached 16,000 tons of ore per day. Large quantities of aluminous and ferrous impurities in the ore have caused more difficulty than expected, and additional leaching and filtering capacity is needed to treat the 26,000 tons per day for which the plant was designed.

Overall copper production at El Teniente decreased about 19 percent to 48,124 tons of fire-refined copper and 92,256 tons of blister from the 1970 totals of 65,364 tons of fire-refined copper and 108,458 tons of blister.

Labor unrest resulting from uncertainties surrounding nationalization was particularly unsettling at El Teniente. This was partially because the labor force, with the exception of two high-level administrators, was entirely Chilean. Thus a government decree issued in December 1970 changing salary payments from dollars to escudos and applying the change to Chileans sooner than to foreign nationals affected El Teniente more than other mines which were partially staffed with foreign supervisors. Another decree on March 9, 1971, placed a ceiling on salaries in government-owned or -controlled companies, including El Teniente, and resulted in further dissatisfaction. Some Chilean supervisors were also concerned with political and personal accusations made against them by pro-nationalization factions because of their position as Chilean citizens and as management employees of a U.S.-

owned company. By June 1971 a total of 156 supervisory employees had resigned, creating a serious problem. New design smelting and concentrating equipment, with which few Chileans had experience, was being introduced at this time and when the supervisors who had been trained to operate it resigned their inexperienced successors were unable to maintain production. Considerable equipment, including three convertors, was damaged in February and March, resulting in lost production and a declaration of force majeure.

On May 25 a group of government administrative overseers were placed in control of El Teniente and they continued in charge until nationalization took effect in July. In June force majeure was again declared when production dropped over 3,000 tons to less than 9,000 tons, because of continuing operating difficulties and a very heavy snowstorm.

Natural events also caused production losses. An extremely severe drought occurred during 1967–69 and supplies of water for the concentrator and for hydroelectric plants were seriously reduced. A storm on June 21 deposited 6 to 12 feet of snow in the El Teniente area, causing avalanches that blocked rail traffic between the mine and concentrator for a week. The storm caused power failures and transportation difficulties which also stopped smelting operations.

The expansion to increase production capacity by 100,000 tons per year to 280,000 tons was substantially completed by July, but no increase in production was achieved because of the drought and labor unrest. The new installations were being broken in when nationalization took effect. According to separate studies made in mid-1971 for the Chilean Government by Société Française d'Etudes Minières (SOFREMINES), a French mineral consulting firm, and a group of Soviet mining experts, the installations should be able to reach their design capacity when adequate water is available.

The Rio Blanco mine of Cía. Minera Andina, S.A., commenced production in 1971 and concentrator design output was reached in July when 274,000 tons of ore were treated and 18,000 tons of concentrate containing 5,400 tons of copper were recovered. During the fourth quarter of 1971 production was 17,100 tons of contained copper in concentrate. Total 1971 production was 52,800 tons of copper in concentrate.

The Mantos Blancos mine and plant produced 26,600 tons of fire refined copper and an additional 4,000 tons of copper in concentrates, an overall decrease of 7 percent from the previous year's total.

Mine production at Disputada decreased 11 percent in 1971 to 34,300 tons of copper in concentrate. Blister production at the Chagres smelter was 18,000 tons, a small increase above that of the previous year.

Production at the Las Ventanas and Paipote smelters of Empresa Nacional de Minera (ENAMI) from small- and medium-size mines was 69,400 tons, an increase of 6 percent from that of 1970. The ENAMI refinery produced 100,400 tons of metal of which 63,200 tons was toll refined from blister produced at other smelters. Damage on July 8 by an earthquake to the ENAMI electrolytic refinery near Valparaíso and to transportation systems caused a temporary suspension of shipments.

Construction of the mine and the vat-leaching plant at Sagosca, Tarapoca Province, by Continental Copper and Steel Industries Inc., Corporacíon del Cobre, and the International Finance Corp., was nearly completed at the end of 1971. Production is scheduled to begin in early 1972. An orebody estimated to contain 16 million tons of ore grading 2.2 percent copper has been prepared for open-pit mining. Vat leaching of crushed ore will be done at a 4,000-ton-per-day rate with cementation of the dissolved copper. An annual production of 24,000 tons of copper is projected. A 400-ton-per-day contact sulfuric acid plant is also being constructed.

An agreement between the Chilean and Romanian Governments, signed in January, provided for the establishment of copper refineries in both Chile and Romania with a combined annual capacity of 35,000 to 40,000 tons. The plants will be jointly owned with each country having a 51-percent interest in the plant constructed in its territory. Both refineries will be supplied by blister from Chilean smelters.

Mineral exploration by the United Nations Development Program and the Chilean Government at the Las Pelambres deposit delineated 300 million tons of copper-molybdenum ore with a grade of 1 percent copper. Additional very large resources are indicated below and bordering the area drilled. Las Pelambres is about 100 kilometers east of Coquimbo at an elevation of 11,000 feet. An all-weather road is being constructed to the site.[3]

Iron Ore.—Following introduction of the amendment to completely nationalize the mineral industries, Cía. de Acero del Pacífico, S.A. (CAP), the Government-owned steel corporation, negotiated purchase agreements for privately owned iron mines in Chile. The price offered was the book value of the plants and was thus about the same as the maximum compensation that would be allowable under the amendment.

Bethlehem Steel Corp. sold its El Romeral and El Tofo mine plants and other facilities in Chile to CAP in March 1971 for $22.4 million. Production in 1970 from these properties was 2.7 million tons. Payment of principal plus interest at 5.75 percent is to be made in 15 annual installments commencing July 1, 1973, with about two-thirds of the total being payable by 1977. About 75 percent of Bethlehem's investment had been insured by the Oversees Private Investment Corp. and this insurance also covers the purchase payments. The properties of Cía. Minera Santa Bárbara, S.A., and its 99-percent-owned subsidiary Cía. Minera Santa Fe were obtained by CAP in November 1971. No payment was made to Santa Bárbara shareholders for their equity because the book value of the company assets was less than corporate debts plus auditing fees required for the takeover. A 35.7-percent interest in the steel grinding-ball plant of ARMCO-CHILE Co. was sold to CAP by ARMCO Steel Corp. in March 1971 for $1.0 million, the value placed on an original investment by ARMCO of about $1.5 million.

Production of iron ore during 1971 was 11,228,000 tons, about the same as during 1970. The average grade of ore produced was 61.6 percent iron. El Romeral and El Tofo operated by Bethlehem until March 31 and by CAP the remainder of the year produced about 2.7 million tons, of direct shipping ore and concentrates, about the same as during the previous year. An increase in production to 4.0 million tons by 1975 is planned. Shipments by Bethlehem-Chile Iron Mines Co. from January 1, 1971, to March 31, 1971, were as follows (in metric tons):

Romeral Division:	
Furnace ore to United States	384,417
Furnace ore to Japan	400,857
Furnace ore to CAP steel mill	201,393
Local sales	428
Total	987,095
Tofo Division:	
Furnace ore to United States	197,382
Fines to United States	28,652
Local sales of fines	706
Total	226,740

Source: Skillings' Mining Review. V. 61, No. 12, Mar. 18, 1972, p. 8. (Original data in short tons converted at factor of 1 short ton equals 0.90785 metric ton).

CAP shipped 3.3 million tons of direct-shipping ore during 1971 from the Algarrobo mine, approximately the same tonnage as in 1970. An increase in production capacity to 3.8 million tons by 1975 is planned. Shipments from mines now owned by CAP but operated until November by Cía. Minera Santa Bárbara decreased 12 percent to 4.1 million tons because of reduced export demand.

Cía. Minera de Atacama shipped 424,645 tons, a decrease of 7 percent from the 1970 total.

Construction, now in progress by CAP for a mine of 2.8 million tons annual capacity at the Boquero Chanar deposit, is scheduled for completion in 1975. CAP is also planning a later development of the Laco and Cerro Negro deposits. Prior to nationalization Santa Bárbara had planned to place these deposits in production.[4]

Iron and Steel.—Steel production by CAP, the Government steel monopoly, was 600,000 tons of ingot steel in 1971 compared with 592,000 tons poured in 1970.

Loans of $180 million were obtained from European and Japanese sources to finance an expansion in steel-making capacity from the present 650,000 tons per year to 1 million tons in 1975. New basic oxygen steel furnaces will augment the present open-hearth and electric facilities.

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[3] The Anaconda Company. 1971 Annual Report. 33 pp.
Cerro Corp. 1971 Annual Report. 32 pp.
Kennecott Copper Corp. 1971 Annual Report. 32 pp.
Metals Week. Chile's Troubled Copper Mines. V. 42, No. 15, Apr. 12, 1971, pp. 30–31.
World Mining. What's Going on in World Mining. V. 7, No. 10, September 1971, p. 57.

[4] Bethlehem Steel Corp. 1971 Annual Report. 13 pp.
Metals Week. Chile's New Iron Ore Plan. V. 42, No. 14, Apr. 5, 1971, pp. 5–6.
Skillings' Mining Review. 1971 Company Iron Ore Shipments. V. 61, No. 22, May 27, 1972, pp. 15–16.

Other Metals.—Molybdenum output increased 11 percent to 6,321 tons. All recovery was as a byproduct of copper production at the Chuquicamata, El Salvador, and El Teniente plants, which produced 59, 21, and 20 percent of the total, respectively. A large increase at Chuquicamata, of from 2,340 to 3,720 tons of molybdenum more than offset reductions at El Salvador and El Teniente. The increase was due to greater production of sulfide concentrating ore from which byproduct molybdenum is recovered. Past copper production at Chuquicamata has come mainly from oxidized ore treated by leaching, but production is now being shifted to the underlying sulfide ore due to approaching depletion of oxidized material. Gold production increased 23 percent to 64,417 troy ounces due to greater production of gold containing copper concentrates at Chuquicamata and Andina, the stimulation of higher prices, and to better metallurgical recovery at precious metal refineries. Production, during 1970, was over 82 percent as a byproduct from copper mines, over 17 percent from gold mines, and less than 1 percent as a byproduct from silver, lead, and zinc mines. Silver production increased 119 percent from a reported 2,450,000 to 5,360,000 troy ounces also due to greater production of sulfide copper concentrates and higher metallurgical recoveries. Nearly 98 percent of the output, during 1970, was a byproduct of copper production, about 2 percent was a byproduct of lead and zinc production, and less than 1 percent a byproduct of gold mining or a product of silver mining.

NONMETALS

Fertilizer Materials.—*Nitrates.*—Nitrate production in 1971 included 642,097 tons of sodium nitrate, an increase of 24.5 percent from that produced in 1970, and 186,828 tons of potassium nitrate, an increase of 18.1 percent. On May 31 Anglo-Lautaro announced that it had sold its interest in Sociedad Química y Minera de Chile, S.A., to Corporación de Fomento de la Producción (CORFO), who are now sole owners of the company which controls nearly all of Chile's nitrate and iodine production. Anglo-Lautaro received $4.1 million in cash and an 8-percent note of $4.1 million for its holdings which included 49 percent of the outstanding shares and Sociedad Química debentures having a face value of $24.6 million.[5]

Iodine.—Iodine production increased 17.9 percent to 2,622 tons. Additional production facilities were opened at the Victoria plant in 1971. The price of iodine was raised $0.68 per pound in early February by the Chilean Nitrate Sales Corp., as a result of increased world consumption.[6]

Salt.—Salt production was 424,347 tons, a decrease of 18 percent from the previous year. In December 1970 Diamond Crystal Salt Co. sold its interest in the rock salt producing company, Cía. Minera Santa Andriana, S.A., to the other owners, Marcona Corp. and various Chilean investors.[7]

MINERAL FUELS

Coal.—The coal mining industry was nationalized early in 1971 and management taken over by CORFO. Production, with government support, increased 7.5 percent to 1,623 million tons. Demand for steam coal for power generation decreased during the current year because of increased production from hydroelectric plants made possible by the ending of the drought conditions of the previous years. Consumption was also reduced by a shutdown of the Bocamina thermoelectric plant because of transformer failures. Inventories increased considerably during the year. Consumption of metallurgical coal is estimated at 220,000 tons of domestic and 270,000 of foreign.

Petroleum and Natural Gas.—Empresa Nacional del Petróleo (ENAP) continued seismic exploration in 1970 and completed 220 kilometers of refractivity profile, compared with 107 kilometers of refractivity and 246 kilometers of reflectivity profile logged in the previous year. Drilling activity increased, particularly extension and development drilling. Seventy-eight holes having a total depth of 168,477 meters were drilled, 14 percent more footage than was completed in 1970. All drilling was in Magallanes Province. The type of holes drilled and drilling results are tabulated below:

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[5] Wall Street Journal. Anglo-Lautaro to Sell Nitrate Industry Stake to Chilean Government. V. 67, No. 99, May 25, 1971, p. 7.

[6] Chemical Week. Market Newsletter. V. 108, No. 6, Feb. 10, 1971, p. 39.

[7] Diamond Crystal Salt Co. 1971 Annual Report. 9 pp.

Type of well	Number of completions			
	Petroleum	Gas	Dry	Total
1970:				
Exploration	1	1	16	18
Extension	--	--	6	6
Development	17	9	16	42
Total	18	10	38	66
1971:				
Exploration	2	--	15	17
Extension	1	1	11	13
Development	31	1	16	48
Total	34	2	42	78

Offshore oil exploration continued under a cooperative financing agreement between ENAP and the United Nations Development Program. A countrywide program of petroleum exploration was initiated by Chilean geologists assisted by a Soviet geological mission.

ENAP reported gross withdrawals of 282,034 million cubic feet of natural gas, an increase of 4.7 percent over the 1970 total. Mainland fields supplied 53.6 percent and Tierra del Fuego fields the remainder. Posesión field (mainland) remained the largest producer, yielding 28.4 percent of the total, followed by Cullen (Tierra del Fuego) with 12.3 percent, and Daniel (mainland) with 11.3 percent. About 72.7 percent of the total volume of gas withdrawn at Posesión was reinjected, while 71.5 percent of that withdrawn was reinjected at Cullen and 49.1 percent at Daniel. Approximately 55.2 percent of gas withdrawn from all fields was reinjected. A total of 126,252 million cubic feet of natural gas was marketed or consumed by oil and gas production facilities.

The total production of natural gas liquids increased 34.0 percent from the 1970 output, mainly because of the contribution of a new natural gas treatment plant in the Posesión field. This plant has a rated input capacity of 300 million cubic feet of natural gas per day and an output capacity of 2.4 million barrels of natural gas liquids per year. Exports of liquefied propane and butane (to Argentina, Brazil, and Uruguay) increased 185 percent to 443,727 barrels, reflecting additional production from the new Posesión plant. New pipelines from Posesión to Cabo Negro and new separation, storage, and shiploading facilities at Cabo Negro were also placed in operation during the year. Imports of propane and butane decreased 3.8 percent to an estimated 971,850 barrels.

Crude petroleum production increased 3.6 percent to 12,882,000 barrels from the 1970 output. Daily production averaged 35,290 barrels. All production was from Magallanes Province. Fields on the island of Tierra del Fuego yielded 47.7 percent of the production and mainland fields across the Straits of Magellan supplied the remainder. The largest production increases were made at Daniel and Daniel Este fields, 270,000 and 383,000 barrels, respectively. The following table shows production for 1970 and 1971 by field.

Location and field	Production (thousand 42-gallon barrels)	
	1970	1971
Mainland:		
Daniel	1,995	2,265
Daniel Este	1,432	1,815
Cañadón	922	764
Posesión	1,087	1,124
Others	507	769
Total	5,943	6,737
Tierra del Fuego:		
Calafate	2,209	2,274
Cullen	1,322	1,199
Catalina Sur	564	426
Tres Lagos	729	710
Others	1,665	1,535
Total	6,489	6,144
Grand total	12,432	12,881

Imports of crude petroleum received at refineries were 19,364,000 barrels, an increase of 58 percent above 1970 receipts. Imports supplied 65.4 percent of the petroleum refined (90 percent at the Concón refinery, 44 percent at Concepción, and none at Manantiales). Imports were from the Middle East, Colombia, Venezuela, and Bolivia. The increase in crude consumption was made possible by an expansion of the Concepción refinery where a topping plant with a 24,000-barrel-per-day capacity was completed during early 1971.

Total petroleum refined during the year was 36,528,000 barrels, an increase of 32 percent over that of 1970. Total production and refining losses for all refineries is shown in table 1. The Concón refinery processed 16,662,000 barrels, Concepción 19,330,000 barrels, and Manantiales 536,000 barrels. Following is a summary of finished products recovered at the Concón and Concepción refineries:

Product	Net production (thousand 42-gallon barrels)	
	Concón	Concepción
Aviation gasoline	97	...
Other gasoline and naphtha	5,043	6,431
Jet fuel	501	72
Kerosine	1,385	2,159
Distillate fuel oil	2,417	3,128
Residual fuel oil	5,238	4,758
Liquefied petroleum gas	449	1,709
Other	454	388
Total	15,584	18,645

The Concón refinery is being enlarged from 50,000 barrels per day to 60,000, and the Concepción refinery from 60,000 to 72,000 barrels. Both of these expansions are scheduled for completion in 1972.

Petroquimica-Dow, S.A., began operation in early 1971 of a petrochemical plant near Concepción having an annual capacity of 15,000 tons polyvinyl chloride, and 20,000 tons polyethylene. Petroquimica Chilena initiated design and engineering for a plant near Concepción to produce acetaldehyde, acetic acid, vinyl acetate, and oxo-alcohols.[8]

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[8] Empresa Nacional del Petróleo, Chile. Boletín Estadístico, Sección Tecnica, 4° Trimestre y Anual. V. 54, 1971, 58 pp.

Mario, Marino P. Developments in South America and Caribbean Area. Am. Assoc. Petrol. Geol. Bull., v. 55, No. 9, September 1971, pp. 1437-1441.

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The Mineral Industry of the People's Republic of China

By Charles L. Klingman [1]

The year 1971 was characterized by a thawing of relations between the People's Republic of China (PRC) and the outside world. In July 1971 it was announced that the President of the United States would visit the PRC early in 1972, a truly unprecedented event. There existed a large potential for trade between the United States and the PRC but in 1971 such trade was practically nonexistent.

Mineral production in the PRC did show an improvement of about 10 percent in 1971, and was valued a total of about US$7 billion.[2] Foreign trade of all kinds to and from the PRC totaled $4.6 billion, with slightly more goods being exported than imported. The major mineral commodities imported were iron and steel, nonferrous metals, and fertilizers. Mineral exports were small and consisted mainly of the traditional materials such as antimony, tin, tungsten, barite, fluorspar, salt, and talc. The tonnages involved showed little change from those of 1969–70.

It was reported that there was a 25-percent increase in the production of metallurgical equipment and an 18-percent increase in electric power output in 1971. Neither of these items are minerals per se but are certainly indicators of a sizable increase in mineral production. The PRC produced about $3.7 billion worth of fuels; $2.6 billion of iron and steel, and other ferrous metals; $370 million of nonferrous metals; and $400 million of nonmetallic minerals The greatest deficiency of natural resources lay in the field of nonferrous metals such as copper and aluminum.

Government Policies and Programs.—National policies have to be understood and taken into account when attempting to analyze the sometimes baffling or apparently contradictory actions taken by the Chinese mineral industries. The enhancement of the Chinese position as a world power and reduction in dependence on other nations seemed to be guilding principles which influenced all mineral policy decisions. The political impact of an action was considered more important than its more obvious or practical side. In international trade, the PRC definitely favored developing countries with communistic or strongly socialistic governments. It also refused to do direct business with any nation which maintained ties with the Republic of China on the island of Taiwan.

Virtually no quantitative information on the production and processing of Chinese minerals was published. The qualitative information available was invariably optimistic and dealt with percentage gains of only small segments of the industry which could not be readily extrapolated to nationwide attainments. The year 1971 marked the beginning of the PRC's fourth 5-year plan, but no specific goals were announced.

In order to be as independent of other nations as possible and to better utilize the enormous population of the country (800 million), the PRC Government urged the exploration for and development of even low-grade, noncompetitive mineral supplies. Such "backyard" operations, even though often small and inefficient, had a combined, significant impact on the economy of the country. In the fields of coal and iron mining and processing, for instance, as much as a third of the nation's supply came from these substandard operations. The PRC Government urged production from native sources to satisfy needs even though the same goods could have been readily obtained by importation. The Government also sent skilled workmen from the larger, more efficient mines and smelters to the less developed portions of the country to disseminate knowledge and

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[1] Physical scientist, Division of Nonmetallic Minerals.

[2] No information is available on the money value of the PRC mineral wealth and trade in terms of PRC yuan. Valuations given in this paper were obtained by applying average world prices in U.S. dollars to known tonnages. In 1971 approximately 2.5 PRC yuan were equivalent to one U.S. dollar.

Table 1.—People's Republic of China: Estimated production of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity[1]	1969	1970	1971
METALS			
Aluminum:			
Bauxite, gross weight[2]	450,000	500,000	550,000
Alumina, gross weight	230,000	250,000	270,000
Metal, primary, refined	120,000	130,000	140,000
Antimony mine output, metal content	12,000	12,000	12,000
Bismuth mine output, metal content	250	250	250
Cadmium smelter production	100	100	100
Copper:			
Mine output, metal content	100,000	100,000	100,000
Metal, refined	100,000	100,000	100,000
Gold mine output, metal content ____ troy ounces	50,000	50,000	50,000
Iron and steel:			
Iron ore[3] ____ thousand tons	40,000	44,000	48,000
Pig iron ____ do	20,000	22,000	27,000
Crude steel ____ do	16,000	[r] 18,000	21,000
Rolled steel ____ do	13,000	14,000	16,000
Lead:			
Mine output, metal content	100,000	100,000	100,000
Metal, refined	100,000	100,000	100,000
Magnesium metal, primary	1,000	1,000	1,000
Manganese ore ____ thousand tons	1,000	1,000	1,000
Mercury ____ 76-pound flasks	20,000	20,000	26,000
Molybdenum mine output, metal content	1,500	1,500	1,500
Silver mine output, metal content ____ thousand troy ounces	800	800	800
Tin:			
Mine output, metal content ____ long tons	20,000	20,000	20,000
Smelter ____ do	20,000	20,000	20,000
Tungsten mine output, metal content	8,000	8,000	8,000
Zinc:			
Mine output, metal content	100,000	100,000	100,000
Metal, refined	[r] 100,000	100,000	100,000
NONMETALS			
Asbestos	160,000	170,000	160,000
Barite	140,000	150,000	140,000
Cement, hydraulic ____ thousand tons	10,000	10,000	11,500
Fertilizer materials, natural, crude, phosphate rock ____ do	1,100	1,200	1,200
Fluorspar	250,000	270,000	250,000
Graphite	30,000	30,000	30,000
Gypsum	550,000	550,000	550,000
Magnesite ____ thousand tons	[r] 900	1,000	1,000
Pyrite:			
Gross weight ____ do	1,800	2,000	2,000
Sulfur content ____ do	800	900	900
Salt ____ do	15,000	16,000	16,500
Sulfur, elemental	250,000	250,000	250,000
Talc	150,000	150,000	150,000
MINERAL FUELS AND RELATED MATERIALS			
Coal, all grades ____ thousand tons	330,000	360,000	390,000
Coke, all types ____ do	17,000	18,000	22,000
Petroleum:			
Crude:			
From oil wells ____ thousand 42-gallon barrels	123,000	146,000	169,000
From oil shale ____ do	22,000	29,000	35,000
Refinery products ____ do	139,000	168,000	196,000

[r] Revised.

[1] In addition to the commodities listed for which quantitative estimates of output have been made, the People's Republic of China is known or is believed to have produced the following commodities, for which no estimate, even of order of magnitude, has been prepared, owing to a paucity of general information upon which to base an estimate: arsenic, chromite, nickel, titanium minerals, uranium, boron, feldspar, various clays, lime, mica, various industrial and dimensions stones, and sand and gravel. Other unlisted commodities also may be produced.

[2] Mostly diasporic bauxite. Data shown include only the bauxite for aluminum manufacture; in addition 100,000 to 200,000 tons was produced each year for making refractories.

[3] Converted to equivalent 50 percent Fe ore.

techniques for the improvement of the less productive installations. The Government sponsored innovations, substitutions, or makeshift methods for use in exploration, mining, beneficiation, and smelting.

There was an apparent reluctance to export certain metals such as antimony, tin, tungsten, molybdenum, and mercury that were known to be plentiful in the PRC. Possibly such commodities were being stockpiled for military contingencies or they were being withheld in anticipation of future higher prices. The combination of restricted exports and a desire to have a favorable balance of trade forced a limitation on imports to the PRC.

Against a background of isolationist tendencies previously described, the PRC apparently effected a sharp reversal in policy favoring international cooperation during 1971. The Chinese displayed a noticeable softening in attitude towards the United States and paved the way for President Nixon to visit the country during the following year. Diplomatic recognition was afforded the PRC by Canada during 1971 and some smaller countries followed. The PRC was seen to be following a practical course to attain the benefits of international recognition and much needed commodities, equipment, and technical aid.

The PRC also took a pragmatic view of the U.S.S.R. on her northern border. More trade with the Soviet Union was allowed but certain industries were moved away from the border for protection.

PRODUCTION

Although there is a paucity of factual data regarding mineral production in the PRC, it does appear from various claims that in 1971 there was an overall improvement in mineral output of perhaps 10 percent. This is a continuation of the improvement evidenced in 1970 over that of 1969.

The PRC is said to have a total mineral output worth $7 billion and ranks as the fourth largest mineral producer in the world. This appears, however, to be a function of size rather than efficiency. On a per capita basis the PRC ranks in 88th place out of 130 nations and on a per square-mile basis ranks 60th in mineral production.[3]

TRADE

Total foreign trade (imports plus exports) in 1971 was about $4.6 billion, up by 9 percent over that of 1970. A small favorable trade balance of just over $100 million was attained. Minerals and related products were very important in the country's imports; during 1971, steel was valued at approximately $450 million, nonferrous metals at $155 million, and fertilizers at $180 million, with the three items combined accounting for nearly two-fifths of all imports. On the other hand, exports consisted primarily of nonminerals.

Japan was the PRC's leading trading partner, accounting for about a fifth of the total trade or just over $900 million—roughly half exports and half imports. Minerals and metals were very important in Japan's exports to the PRC. During 1971, Japan exported $281 million worth (1.93 million tons) of steel products to the PRC; $117 million worth of fertilizers; $12 million worth of nonferrous metals; and considerable machinery and equipment. Japan's imports of mineral-related products were generally low-priced items. Japan's 1971 imports from the PRC included 1,001,273 tons of salt; 344,353 tons of anthracite; 96,828 tons of fluorspar; 53,896 tons of aluminous shale; 45,434 tons of talc; 44,822 tons of steatite or soapstone; nearly 40,000 tons of various manganese materials; 4,500 tons of barite; 3,083 tons of antimony concentrates; 191 tons of tin; and 79 tons of tungsten concentrate.

Hong Kong ranked a close second to Japan in trade with the PRC. However, minerals and metals were of little significance in the transactions.

Canada has become a growing factor in the PRC's trade. Total trade between the two countries in 1971 was about $217 million, the bulk of which was the flow from Canada to the PRC in the form of wheat, paper and pulp, and electrical cables. Mineral exports from Canada to the PRC were

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[3] Intermet Bulletin. The Chinese Mineral Production. V. 1, No. 4, April 1972, pp. 17–22.

Table 2.—People's Republic of China: Apparent exports of selected mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum:			
Bauxite	10,714	26,153	West Germany 15,491; France 4,126; Italy 4,036.
Oxides and hydroxides value, thousands	$258	$81	Finland $79.
Metal semimanufactures	61	--	
Arsenic oxide and acids	1,428	515	Italy 272; Japan 243.
Copper metal including alloys:			
Unwrought	100	150	All to Italy.
Semimanufactures	66	--	
Iron and steel:			
Ore and concentrate	14,639	--	
Metal:			
Pig iron	3,665	1,390	All to Japan.
Steel semimanufactures:			
Universals, plates and sheets	382	131	All to Italy.
Tubes, pipes, and fittings	90	258	Australia 145; United Kingdom 72; Finland 41.
Total	472	389	
Manganese ore and concentrate	26,555	37,485	Japan 32,080; Australia 3,405; Denmark 2,000.
Mercury 76-pound flasks	1,363	348	France 116; West Germany 116; United Kingdom 116.
Molybdenum concentrate	[r] 190	--	
Tin metal, unwrought and semimanufactures long tons	[r] 3,513	4,062	France 1,768; Netherlands 672; Denmark 585.
Tungsten ore and concentrate	5,252	3,631	Austria 1,875; Sweden 788; United Kingdom 424.
Other: [2]			
Ores and concentrates n.e.s	4,222	1,252	Japan 1,232; West Germany 20.
Metals and alloys n.e.s	1,508	221	West Germany 160; France 28; Switzerland 14.
NONMETALS			
Abrasives, natural n.e.s	687	786	All to Japan.
Barite and witherite	41,853	53,971	Japan 21,000; West Germany 12,989; Italy 9,002.
Boron compounds, oxide and acid	1,809	940	All to Japan.
Cement	1,495	1,765	Japan 944; Netherlands 427; Norway 262.
Clays:			
Crude	53,820	84,984	Japan 72,818; Italy 6,060; West Germany 2,393.
Refractory products	328	--	
Diamond:			
Gem value, thousand dollars	$8,082	$70	Japan $35; Switzerland $35.
Industrial do	$1,456	$84	All to Belgium-Luxembourg.
Feldspar and fluorspar	[3] 164,673	143,550	Japan 122,226; Sweden 8,735; U.S.S.R. 7,100.
Fertilizers, crude	258	--	
Graphite, natural	6,677	8,240	West Germany 5,590; United Kingdom 2,460; Austria 190.
Magnesite	[r] 18,875	21,612	United Kingdom 6,504; Japan 4,815; Norway 3,171.
Mica	1,320	1,285	All to United Kingdom.
Pigment, mineral, iron oxides, processed	88	774	Japan 661; Italy 113.
Quartz and quartzite	4,060	3,408	All to Japan.
Salt thousand tons	1,022	976	Do.
Stone, sand and gravel	7,612	8,280	Do.
Talc, soapstone, and pyrophyllite	75,362	82,432	Japan 52,984; West Germany 11,262; United Kingdom 9,804.
MINERAL FUELS AND RELATED MATERIALS			
Coal, coke, briquets	201,702	226,945	All to Japan.
Petroleum coke	47,223	73,782	Do.

[r] Revised.

[1] Compiled from data of Australia, Austria, Belgium-Luxembourg, Canada, Denmark, Finland, France, West Germany, Greece, Iceland, Ireland, Italy, Japan, the Netherlands, New Zealand, Norway, Poland, Portugal, Spain, Sweden, Switzerland, Turkey, the U.S.S.R., the United Kingdom, and Yugoslavia.

[2] Sources do not give details on metals included in this category, but presumably the figure consists chiefly of antimony, bismuth, and molybdenum.

[3] Excludes receipts by West Germany and the Netherlands not reported in 1969.

Source: For Poland and the U.S.S.R.: Official import statistics of the respective country; for all other countries: Statistical Office of the United Nations. 1969 Supplement to the World Trade Annual. V. 5 (Far East), Walker and Company, New York, 1971; pp. 25–37; 1970 Supplement to the World Trade Annual. V. 5 (Far East), Walker and Company, New York, 1972, pp. 107–120.

Table 3.—People's Republic of China: Apparent imports of selected mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum, unwrought and semimanufactures, including alloys	6,781	15,515	United Kingdom 7,510; Canada 5,008; Japan 1,584.
Chromium, oxide and hydroxide	94	310	All from Denmark.
Copper, unwrought and semimanufactures, including alloys	63,202	43,313	United Kingdom 19,729; Japan 14,113; West Germany 9,321.
Iron and steel:			
Pig iron and ferroalloys thousand tons	4	6	All from West Germany.
Scrap do.	86	61	Canada 48; Australia 8.
Steel:			
Primary forms do.	11	15	Japan 11; United Kingdom 2; West Germany 2.
Semimanufactures:			
Bars, rods, angles, shapes, sections do.	644	768	Japan 373; West Germany 30; Yugoslavia 22.
Plates and sheets do.	879	1,047	Japan 756; West Germany 174; United Kingdom 22.
Hoop and strip do.	35	25	Japan 8; West Germany 8; Belgium-Luxembourg 6.
Rails and accessories do.	9	37	Japan 12; Sweden 11; West Germany 9.
Wire do.	88	22	Japan 15; West Germany 6.
Pipes, tubes and fittings do.	344	416	Japan 360; West Germany 51; Italy 3.
Castings and forgings do.	1	1	All from Yugoslavia.
Total do.	2,000	2,316	
Lead, unwrought and semimanufactures, including alloys	44,715	26,735	United Kingdom 26,335; Japan 400.
Magnesium, unwrought	491	30	All from Japan.
Manganese oxides	500	--	
Nickel including alloys, all forms	1,383	4,156	Canada 2,063; France 1,007; United Kingdom 378.
Platinum-group metals, all forms value, thousands	$48,480	$14,240	United Kingdom $8,024; West Germany $5,262; Japan $954.
Silver metal, including alloys do.	$43	$11	United Kingdom $4.
Titanium oxides	525	317	All from Japan.
Tungsten	--	2	Do.
Zinc:			
Oxide	906	--	
Metal including alloys, all forms	20,335	19,218	Australia 9,112; Canada 5,106; Finland 5,000.
Other:			
Unwrought and semimanufactures	507	43	All from Japan.
Radioactive metals n.e.s. value, thousands	r $50	$44	All from France.
NONMETALS			
Clays, refractory products	249	337	All from West Germany.
Diamond:			
Gem value, thousands	$22,764	$20,195	United Kingdom $20,049; Switzerland $146.
Industrial do.	$3,633	$2,426	Belgium-Luxembourg $2,212; West Germany $214.
Fertilizers manufactured:			
Nitrogenous	3,573,000	2,625,288	Japan 1,773,257; Italy 241,429; West Germany 240,774.
Phosphatic	700	--	
Potassic	2,000	10,500	Italy 5,500; Japan 5,000.
Other, including mixed and unspecified	54,752	10,000	All from Belgium-Luxembourg.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	1,350	2,700	All from Japan.

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r Revised.

[1] Compiled from export data of Australia, Austria, Belgium-Luxembourg, Bulgaria, Canada, Denmark, Finland, France, West Germany, Greece, Iceland, Ireland, Italy, Japan, the Netherlands, New Zealand, Norway, Poland, Portugal, Spain, Sweden, Switzerland, Turkey, the U.S.S.R., the United Kingdom, Yugoslavia, and Zambia.

Source: For Bulgaria, Poland, and the U.S.S.R.: Official export statistics of the respective country; for all other countries: Statistical Office of the United Nations. 1969 Supplement to the World Trade Annual. V. 5 (Far East), Walker and Company, New York, 1971, pp. 38–46; 1970 Supplement to the World Trade Annual. V. 5 (Far East), Walker and Company, New York, 1972, pp. 121–130.

worth $7.9 million during 1971, consisting of $5.0 million (about 120,000 tons) worth of steel scrap; $2.2 million worth of aluminum; and $0.7 million (250 tons) worth of nickel. In view of Canada's diplomatic recognition of the PRC and the growing number of exchanges of technical missions, it is very likely that overall and mineral trade between the two countries will increase substantially. Even in the past, Canada had shipped moderate tonnages of nonferrous base metals to the PRC sporadically.

U.S. trade with the PRC has so far been nominal. The total value of this trade in 1971 was only about $5 million.

Among Western European nations, West Germany headed the list in 1971. Total trade with the PRC was valued at $218 million, and included $66 million worth of steel products; $31 million worth of machinery; $8 million worth of fertilizers; and $3 million worth of nonferrous metals. PRC trade with the United Kingdom amounted to about $146 million, a sizable decline from 1970 with a sharp drop in the shipment of nonferrous metals, primarily on account of the PRC's direct importation of copper from Zambia rather than through the London Metal Exchange.

The PRC's trade with Eastern Europe was only about $1 billion in 1971, less than a third of the trade with the rest of the world. Mineral trade has also become relatively unimportant. It will be recalled that up to a decade ago, the PRC shipped large tonnages of its famous export minerals and metals to the U.S.S.R. while importing oil, aluminum, and other products.

Chile and Peru made trade agreements with the PRC during the year after extending diplomatic recognition. These agreements were very mineral-oriented, the two South American countries being committed to export annually to the PRC about 105,000 tons of copper, 10,000 tons of lead, and 10,000 tons of zinc. These exports of minerals and metals have a total worth of about $150 million. In exchange, the PRC has agreed to extend aid and interest-free loans to these two countries, in addition to supplying commodity exports.

COMMODITY REVIEW

METALS

Aluminum.—During 1971, the PRC attempted to purchase from outside the country about as much aluminum as it produced, which was approximately 140,000 tons. As a result of sharp increases in demand by the electrical, machinery, and other industries, the country's industrial development program calls for much larger quantities of aluminum than present productive capacity can supply.

The PRC's efforts to import aluminum, however, fell far short of target. Among the leading suppliers, it is known that in 1971 Japan shipped 15,030 tons of aluminum to the PRC; France shipped 6,700 tons; Australia shipped 6,000 tons; and Canada shipped 5,000 tons. The Australian shipment was made by Comalco Industry Pty. Ltd. from its new reduction plant at Bluff, New Zealand. Comalco, with very large resources and facilities in Australasia, has already signed a second pact with the PRC. Alcoa of Australia Pty. Ltd. was also ready to ship to the PRC. Alcan Aluminum Ltd. of Canada also entered into another agreement to sell aluminum from Kitimat to the PRC. The U.S.S.R. and Romania have drastically cut down their aluminum shipments to the PRC since 1969. Late in 1971, a contract was signed between the PRC and Guyana to purchase 40,000 to 50,000 tons of alumina yearly.

The PRC's aluminum resources are extensive but are not of a particularly good grade. The Fushun reduction plant in Manchuria, which uses aluminous shale and alumina from a plant in Shantung, has been stabilized at about 100,000 tons of aluminum annually. The No. 2 plant is located at Sanmen Gorge, Kansu, and its capacity may be 20,000 to 30,000 tons. Four other plants of some size were Changling in Kirin, Wuhan in Hupeh, Hofei in Anhwei, and Nanning in Kwangsi. Inferior resources and shortages of electricity may result in long-term imports of both alumina and aluminum.

Antimony.—Even though the PRC has been, historically, the world's largest source of antimony, there did not appear to be any significant export of this metal in 1971. The withholding of antimony from the world market was probably due to an intensified stockpiling program and possibly to an increased internal demand for the metal. Internal production of antimony was estimated to have remained at the same level in 1971 as it was for the past several years.

The richest source of antimony in the world was the Hsi Kwang-Shan mine 20 miles northeast of Hsin Hua in Hunan Province. Reserves at this one mine were estimated to be 1.5 million tons of metallic antimony.

Bismuth.—The PRC continued in 1971 to produce about the same amount of bismuth as it had for several years, but virtually all of it was being consumed internally or being stockpiled. The bismuth was obtained as a byproduct in refining of tungsten and nonferrous metals. The PRC apparently had the capability to be a major world supplier of bismuth if it's policy permitted increased business with free world countries.

Copper.—The PRC's annual demand for copper may be three times the 100,000 tons estimated to have been produced in 1971. Apparently, the country has not been able to develop the large porphyry copper deposits reportedly discovered some years ago, due in part to the inadequacy of smelting facilities. Small refineries located in Shanghai, Taiyuan (Shansi), Chungtiaoshan (Anhwei), Wuhan (Hupeh), Shenyang (Liaoning), and Kunming (Yunnan) have operated at capacity in processing the already-available primary and secondary copper. Various inquiries have been made in Japan about building copper smelters and refineries for the PRC, but no construction plans have been announced. Little news was available on Chinese copper mines in 1971. The Tunghua mine in Kirin, after renovating its ore dressing plant, raised copper output from 800 tons before 1969 to 2,500 tons in 1971. Hungtoushan near Fushun, Manchuria, enlarged its beneficiation plant to 2,200 tons of ore per day.

Stationary output and rapidly rising demand for copper by the power and other industries have left no alternative except to import. Accountable imports of nonferrous metals in 1971 totaled about $155 million, down $15 million from 1970; most of this was copper worth nearly $1,000 per ton. During 1971, one-third of the nonferrous imports came from Zambia, one-fifth from Chile and Peru, and one-fourth from the United Kingdom, Japan, and the U.S.S.R.

The PRC has a long-term contract with the Government of Zambia to import 50,000 tons of copper annually as collateral for a $400 million interest-free loan to build a 2,000-kilometer railroad linking it to Tanzania. A 4-year copper agreement was signed in December 1971 with Chile to purchase 65,000 tons of copper (38,000 tons of blister, 18,000 tons of electrolytic copper, and 9,000 tons of copper wire) in 1972 and negotiable tonnages in the subsequent 3 years at London Metal Exchange prices; the PRC will also extend a 20-year, $65 million interest-free loan as part of an aid program. In June 1971, an agreement was signed with Peru for the purchase of 40,000 tons of copper (22,500 tons of blister and 17,500 tons of electrolytic copper) and 10,000 tons each of zinc and lead for delivery before yearend 1972 to be extended for possibly another 3 years at tonnages and prices to be negotiated. The 1972 contract was worth about $45 million and, in addition, the Chinese advanced a $40 million interest-free loan for the development of the Tintaya copper deposit in Peru. The Chinese also indicated that they intend to buy more copper, lead, zinc, and nickel from Canada in the years to come.

Iron and Steel.—The PRC has ample resources of iron ore and fuels for processing the iron but was deficient in steelmaking capacity. Although steel output rose dramatically to about 21 million tons in 1971, there was still need to import about 2 million tons of steel, primarily from Japan and mostly in shaped or formed pieces.

In 1971 the PRC went through another year of expansion in the iron and steel industry, with output reportedly increased by 9 percent in iron ore, 23 percent in pig iron, 17 percent in crude steel, and 14 percent in rolled steel. There was great stress on strengthening the raw material base, both in establishing large enterprises and new small and medium operations. Allied to this policy was the concerted effort to recover steel scrap nationwide; 9.3 million tons were reportedly collected in 1971[4] with more probable in the coming year. There was also emphasis on product quality and variety, as seen from the considerable gain in rolled steel production.

Great interest was shown in 1971 on future expansion of the steel industry. Mention was made about raising steel output to 35 million tons annually by 1975. The Chinese invited a Japanese steel mission to visit the PRC with a view to contracting for large quantities of steel products from Japan during the next few years and asking aid from Japan to build large steel plants, all in anticipation of projected substantial increases in steel consumption within the PRC. Negotiations were underway to purchase oxygen-generating units from Japan's Kobe Steel Works, Ltd., to make converter steel. PRC's steel imports from Japan (Japanese exports) rose from 1,524,000 tons in 1970 (worth $236 million) to 1,931,000 tons in 1971. Imports from other lesser sources also increased. Advances in the PRC's steel production and consumption were commensurate with overall industrial progress. Capacities of major Chinese steel plants are tabulated as follows:

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[4] New China News Agency (International Service in English; Peiping). Feb. 5, 1972, p. 1.

Plant	Province	Blast furnace unit	Steel furnace [1] [2]	Capacity (metric tons per year)
Anshan	Liaoning	10	25 OH	7,000,000
Wuhan	Hupei	3	6 OH	2,500,000
Shanghai	Shanghai	8	Various	2,000,000
Taiyuan	Shansi	5	BOF and electric	1,500,000
Peiping	Peiping	3	Oxygen converter	1,500,000
Maanshan	Anhwei	13	OH and oxygen	1,000,000
Canton	Canton	3	OH and BOF	1,000,000
Penhsi	Liaoning	2	OH and electric	1,000,000
Paotou	Suiyuan	1	2 OH and oxygen	800,000
Chungking	Szechuan	3	2 OH	800,000

[1] OH Open hearth furnace.

[2] BOF Basic oxygen furnace.

The PRC's largest steel base, Anshan, continued to establish records. Output increases during 1970 were reported as follows, in percentages: iron ore, 10; pig iron, 6; crude steel, 9; and rolled steel, 16.[5] Open hearth smelting operations were being improved, with heat time at the No. 1 steel plant cut down by an average of 1 hour (best time is about 7 hours). Technical improvements were made at the Takushan and Tunganshan mines, among others. It was reported that Takushan has become totally mechanized with modern drills, electric shovels, 60-ton automatic dumping cars, and standard gage rail transport.[6]

At the Penhsi complex, also in Manchuria, recent stress has been on expanding the iron ore production base. Penhsi ores though plentiful have to be upgraded from 32 percent Fe to more than 50 percent Fe before use, and it takes two to three tons of crude ore to make a ton of concentrate. For the old standby mine Nanfen, improvements since 1969 have raised annual capacity beyond designed levels by 2.3 million tons for mining, 3.3 million tons for beneficiation, and nearly 1 million tons for sintering; this would correspond to developing a whole new mining complex.[7] In addition, a new mining complex, Waitoushan, with a 3-million-ton-per-year crude iron ore capacity (including beneficiation plant) was completed in a period of 18 months, totally solving Penhsi's iron supply problem.

At the Wuhan steelworks in Hupeh Province, presumably construction continued on the No. 4 blast furnace (the first three were of 1,386, 1,436, and 1,513 cubic meter size, respectively). Again, emphasis has been on strengthening the raw material base. Production at the new Chengchao underground iron mine was stabilized. The Tahungshan iron mine was reopened. The 80-year old Tayeh iron mine was expanded to an annual capacity of 3.4 million tons of high-grade ore.[8]

The Capital steelworks near Peiping apparently made significant gains in efficiency of operation. The grade of sintered ore and concentrates charged to blast furnaces has been raised to 53 percent Fe and 63 percent Fe, respectively. Coke consumption was lowered to 465 kilograms per metric ton of pig iron. At the new Chienan mining district, which has open pit mines and beneficiation plants, production was roughly doubled in 1971. Included in the mines of Chienan are Tashihho, of 1 million tons capacity; Shuichang, a new mine;

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[5] Tung, An. Steelworkers Tap Hidden Potential. China Reconstructs, v. 21, No. 6, June 1972, pp. 26–29.

[6] Ta-kung-pao (Peiping). Apr. 2, 1972, p. 3.

[7] Jen-min Jih-pao (People's Daily; Peiping). July 23, 1972, pp. 1–3.

[8] New China News Agency (International Service in English; Peiping). July 5, 1972.

and Chungkuang, Yangashan, and Tayangchuang.

The Taiyuan steelworks, best known for its Austrian oxygen converters, reportedly was able to cut down consumption of electricity at its No. 3 electric smelting plant sharply. This plant, which produces special steels along with regular steels, reportedly reduced unit electricity consumption by about one-fourth as compared with 1966 consumption. Overall, Taiyuan was said to have topped its 1971 production targets for all major commodities.

Steel production in Shanghai, with at least eight small steel plants, apparently established new records. Increases over 1970 production were small; however, efficiency of operations clearly improved. The Maanshan steelworks in nearby Anhwei Province, supplier of some intermediate iron and steel materials to Shanghai, continued to expand at about a 10-percent annual rate. About 10 major projects, including a medium-sized rolling mill, reportedly were under construction during 1971.[9]

Lead and Zinc.—The Imperial Smelting Process (ISP) plant at Shaokuan in northern Kwangtung Province was finally completed by the British in 1971. The rated production capacity of the plant was 35,000 tons of zinc and 18,000 tons of lead per year.

National production of each of these metals was maintained at approximately 100,000 tons per year. The largest mine in the PRC producing lead and zinc (as well as silver) was the Shin-Kou-Shan mine in the Hunan Province. Other important lead-zinc mines were located in Koun, Liaoning, and Antung Provinces. Probable reserves of lead and zinc deposits were estimated in 1960 to be more than 10 million tons.

Manganese.—The supplies of manganese ore in the PRC are some of the richest in the world. Production in 1971 was maintained at the previous level of 1.0 million tons, with most of it being consumed in the national steel industry. Only 2.0 percent of the manganese was exported. Most of the manganese ore came from the southeast sector of the PRC, primarily from Hunan, Kwangsi, Kwangtung, and Manchuria Provinces.

Mercury.—The PRC remained among the top mercury producers of the world in 1971, but most of it was retained within the country. Exports continued to decline indicating large internal usage or extensive stockpiling.

Tin.—The PRC apparently had abundant supplies of tin ore in 1971. The most important producing area was Yunnan Province close to the city of Kuchiu. The tin in this province occurs in cassiterite lodes which contained 2.4 to 5.0 percent tin along with smaller amounts of arsenic, copper, lead, and zinc. Production was estimated at 20,000 tons per year, but the internal demand, which included possible stockpiling, was 15,000 per year. Only 5,100 tons of tin were exported in 1971. It was probable that large amounts of the metal were being stockpiled in the PRC.

The PRC apparently was deficient in tin-plating equipment as evidenced by the importation of large quantities of tin-plated steel, primarily from Japan.

According to Chinese sources, the PRC's reserves of tin ore are equivalent to 1.5 to 2.0 million tons of metal. The Chinese reported that large tonnages of additional reserves were discovered at the "Yunnan No. 3 Mine" (presumably one of the underground tin mines in Kuchiu), amounting to 50 percent of the total reserves found during the previous decade.[10]

Titanium.—The PRC apparently had adequate supplies of titanium ore and in 1971 converted approximately 3,000 tons into titania, a white pigment for paint. There was no evidence, however, that there were facilities for reducing the ores to metallic titanium.

Tungsten.—Production of tungsten in 1971 was estimated to be 15,000 tons of concentrate which was equivalent to about 8,000 tons of metal. This was 25 to 30 percent of the world tungsten output. Reserves of tungsten in the PRC were even more impressive. They were estimated to be 135 million tons of high-grade ore. Most of these deposits were located in the southern part of the country, mostly in the Kiangsi and the Hunan Provinces. The Pangushan tungsten mine in Kiangsi Province was said to have achieved its production target. At the Tachishan tungsten mine in Kiangsi, a new ore zone deep in the mine was discovered, bringing new life to this old mine.

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[9] New China News Agency (International Service in English; Peiping). Apr. 7, 1972.

[10] New China News Agency (International Service in English; Peiping). Apr. 26, 1971.

Chinese exports of tungsten, measured in terms of accountable tonnages of contained tungsten imported by European countries and Japan from the PRC, show a decline as compared with 1970. The 1971 total was 3,631 tons. The principal importer in recent years has been Austria which took 1,875 tons in 1970 (valued at $11.2 million) and $12.3 million worth in 1971 (higher tonnage than in 1970 in view of prevailing prices). The PRC's exports to Sweden declined from 788 tons in 1970 to 145 tons; and exports to Czechoslovakia declined from 372 tons to 215 tons; and exports to the United Kingdom declined from 424 tons to 17 tons.[11]

The general decline in exports and the relatively low consumption of tungsten probably indicates that large amounts of the metal or concentrate were being stockpiled in the PRC for strategic purposes.

Uranium.—There was sustained activity during 1971 in the mining and beneficiation of uranium. Most of the raw ore came from Kiangsi and Kwangtung Provinces. A gaseous diffusion plant for the separation of the fissionable uranium-235 from the normal uranium-238 has been built near Lanchow in Kansu Province. The uranium-235 has been used in the initiator charges for the hydrogen bomb tests conducted at Lop Nor in Sinkiang Province. There has not been any known international trade in Chinese uranium.

NONMETALS

Asbestos.—Production of asbestos in the PRC in 1971 was estimated at 160,000 tons. This figure ranked the PRC within the top five producers of the world. Virtually all of the asbestos was internally utilized with only minimal amounts available for international trade. Most of the Chinese asbestos came from the town of Shihmien in Szechuan Province where a new body of high-grade ore was recently discovered. The asbestos is of both the short and long fiber chrysotile type.

Barite.—The production of barite was primarily dependent on oil-drilling activity in the PRC in which barite was used as a major component of the oil-drilling mud. Production was estimated at about the same level in 1971 as that of 1969, with more barite being consumed domestically and less being available for export. Japan imported 4,500 tons in 1971 as compared with 37,700 tons in 1966.

Boron Minerals.—A surplus of borax continued, although no specific information was available on the extensive boron-bearing lake deposits in the Iksaydam area of Tsinghai Province.

Cement.—Production of cement reportedly showed about a 15-percent increase in 1971 as compared with that of 1970. This was an industry well adapted to the policy of sponsoring small- and medium-size units without respect to relative efficiency. Raw materials of varying quality for cement manufacture were available throughout the land. About all that was needed were fuel, a calcining furnace, and grinding equipment. Finished cement was needed in all areas of the PRC primarily for agricultural necessities, so a widespread industry to satisfy this need was particularly advantageous from a transportation standpoint.

The bulk of the cement production was from 50 to 60 plants whose annual capacity was between 100,000 and 1 million tons. Some of the larger known cement plants in the PRC are as follows:

Plant name	Province	Capacity (tons per year)
Hantan	Hopeh	1,000,000
Yao Hsien	Shensi	1,000,000
Huahsin	Hupeh	1,000,000
Kwangchow	Kwangtung	700,000
Yungteng	Kansu	600,000
Fushun	Liaoning	550,000
Chungking	Szechuan	550,000
Tatung	Shansi	500,000
Ch'ihsin	Liaoning	400,000
Mutanchiang	Kirin	400,000
Tungfanghung	Kiangsu	400,000
Kunming	Yunnan	330,000
Kweiyang	Kweichow	300,000

Diamond.—It was presumed that diamonds were produced in the PRC during 1971 primarily at the Changte mine in western Hunan Province. There was also some international trade in diamonds. A greater amount was imported than exported and there was more trade in gem quality than in industrial diamonds.

Fertilizer and Chemical Materials.—The PRC's production of fertilizers in 1971 was about the same as that of 1970.[12] Estimates on the actual tonnage vary greatly, and it is not clear whether chemical and ground phosphates are included. Excluding ground phosphates, the order of magnitude for the PRC's production of fertilizers would be about 10 million tons for 1971 or perhaps 1.5 million tons of contained nitrogen. Most output was ammonium sulfate and urea, although superphosphates, ammonium bicarbonates, and mixed fertilizers were also produced. For some years now, the PRC's production of fertilizers has been very important by world standards and the PRC's consumption and importation of fertilizers have been even more important.

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[11] United Nations UNCTAD Committee on Tungsten. Tungsten Statistics. V. 6, No. 3, July 1972, pp. 1–68.

[12] Nitrogen. (The British Sulfur Corp. Ltd.). China—20% Increase in Nitrogen Fertilizer Production. No. 76, March–April, 1972, pp. 7–10.

About three-fifths of the production came from fairly large and modern fertilizer plants. The best known of such plants were Nanking, Kirin, Taiyuan in Shansi, Kunming in Yunnan, Chuchow in Hunan, Yangchow in Kiangsu, Liling in Hunan, Hofei in Anhwei, Tsinan in Shantung, and Lanchow in Kansu. Fertilizer plants also were being built at various petroleum refineries.

Two-fifths of the PRC's fertilizer production come from about 2,000 small-scale plants and 180 medium-scale plants scattered throughout the country. The planning was based on the need to minimize transportation costs, to shorten the period required for plant construction, and to manufacture the fertilizers in the localities where they would be utilized. The small plants were most wasteful but served a purpose. One way to make fertilizers on a small scale was to recover some ammonia from coking; the coke is used in small iron and steel plants, and the ammonia is neutralized by sulfuric acid to make ammonium sulfate.

The PRC's imports of nitrogenous fertilizers are approximately equal to production. Total imports in 1971 have been estimated at about 1.6 million tons of N compared with 1.8 million tons in 1970. Roughly 70 percent of the 1971 imports came from Japan, which depended on the PRC for approximately two-thirds of its fertilizer export market. The PRC received most of the remainder of its fertilizer imports from the small country of Kuwait and from two large consortiums called NITREX and ANIC. NITREX supplied about 12 percent of the imports and ANIC supplied another 10 percent.

Japan's 1971 nitrogenous fertilizer exports to the PRC were valued at $117 million. The breakdown for 1971 was 1.4 million tons of urea valued at $77 million; 840,000 tons of ammonium sulfate valued at $23 million; and 606,000 tons of ammonium chloride valued at $17 million. To equate these products, urea contains 45.4 percent N, ammonium sulfate 21.2 percent N, and ammonium chloride 26.2 percent N. Japan's fertilizer contracts with the PRC for 1972 will be perhaps 10 percent higher than for 1971. NITREX may be withdrawing from the Chinese market temporarily.

Production of pyrite was maintained at about 2 million tons for the year 1971. It was utilized primarily in the manufacture of sulfuric acid which was consumed to a great extent in fertilizers. Some of the pyrite was used to make elemental sulfur.

Phosphate rock production was estimated at about 1.2 million tons in 1971 and most of it was used by the fertilizer industry. In addition, it was necessary to import significant quantities of phosphate rock to supply the demand, mainly from Morocco and North Vietnam.

Fluorspar.—Production of fluorspar in the PRC amounted to about 5 percent of the world supply. Fluorspar production in 1971 was about equal to that of 1969, but was 7 percent lower than 1970 production. There was an ample supply of fluorspar for the steel and aluminum industries, with more than half of the production available for exportation. Japan was the major recipient of the Chinese fluorspar. Major sources of fluorspar were Chekiang, Hopeh, and Kwangsi Provinces.

An innovation in 1971 was the reclamation of fluorine in the form of fluosilicic acid as a byproduct of the phosphate rock industry. This acid was readily converted into various fluorine compounds.

Quartz Crystal.—There apparently was an industry in the PRC for the production of quartz crystals for the electronics industry, but very few verifiable facts are known.

Salt.—The PRC had great apparent demand for salt primarily for use in food, but an increasingly large amount was also consumed by industry. The PRC salt supply, however, was one of the largest in the world, and there was an adequate amount, not only for the nations needs, but also for a significant export business.

A high percentage of the salt supply

came from solar evaporation of sea water. The major sea salt-producing provinces were Kiangsi, Shantung, Hopeh, Liaoning, and Hainan. In addition to the use of sea water, there were several inland lakes at Tsinghai and Szechuan whose waters were evaporated to produce salt, potassium salts, bromine, iodine, and compounds of boron. Bedded deposits of rock salt were worked in Yunnan, Kiangsi, and Hunan Provinces. Plants which produced soda from salt were the Tientsin and the Tsingtao factories.

Steatite and Talc.—Steatite and talc were mined during 1971 from Taling in Liaoning Province. The supply was much greater than the demand, so a large portion of material was exported to Japan, the U.S.S.R., and the United Kingdom. In 1971, Japan imported 44,822 tons of steatite and 45,434 tons of talc from the PRC. Internally, steatite and talc were used principally in the manufacture of electroceramics and electric insulators.

MINERAL FUELS

Coal.—The PRC's total coal reserves were estimated at 309.6 billion tons.[13] and during 1971 production was believed to have reached 390 million tons, which was about 10 percent of the world's coal production. There were seven very large mines or complexes: Chihsi, Fuhsin, Fushun, Hokang, Huainan, Kailan, and Tatung, each of which produced over 10 million tons per year. There were 45 other mines, each of which produced between 1 and 5 million tons. Perhaps the most significant of all, however, were the innumerable medium-size and small mines scattered over virtually every province, which together accounted for about 40 percent of the coal production of the nation.

Coal production continued to increase and, by Chinese reports, more than 8 percent above the 1970 level. Most of the gain was apparently made by small and medium-sized mines. Performance by the larger and better known mines was uneven. Presumably the ones mentioned in the press did well and generally surpassed output of the previous year. Conversely, the ones not mentioned probably produced slightly less than in 1970.

The very large Fushun coal combine in Manchuria apparently produced a few percent more than in 1970. However, many technical improvements were made at this industrial complex. A 170-ton electric train for use in coal transportation was built. The coal excavation equipment plant overfulfilled production targets. Fushun has both underground and open pit mines, with shale oil overlying the very thick bed of bituminous coal. Fushun also produces small tonnages of ornamental vitrainite and a special effort was made in 1971 to recover more of this from the coal washing plants.

At PRC's only other 20-million-ton-per-year coal combine, Fuhsin, extensive new reserves were discovered in 1971. Fuhsin was said to have overfulfilled its 1970 target by 3 million tons of coal, but no claims for surpassing targets were made for 1971, except for the Hsinchu open pit.

The PRC's No. 3 coal combine, Kailan, may soon be attaining the 20-million-ton level with output increasing yearly since 1967 (a 2-million-ton increment in 1968 and a 1-million-ton increment in 1969) and establishing a record in 1971. The upper coal seams of this 90-year-old mining complex have been somewhat worked out, and a project was underway to build blind shafts, slopes, ventilation tunnels, and underground haulageways to further increase production. This project was 40 percent complete by yearend 1971[14] so that a further rise in production can be expected in the next few years.

The Huainan coal combine in Anhwei Province fulfilled 1971 targets ahead of schedule. The Tatung coal combine in Shansi Province probably produced at about the same rate as in 1970, while meeting its production quota for 22 years in a row. Shuangyashan in Heilungkiang Province apparently did well during the year, but there was no news about two larger combines in the same province—Hokang and Chihsi. The Pingtingshan coal combine in Honan Province continued to expand and probably has already surpassed the 10-million-ton plateau.

Many of the lesser coal combines also did well. The No. 3 mine of the Fengfeng combine in Hopei Province met production quotas and ash content specifications during every month of 1971, with output still rising early in 1972. The Yangchuan combine in Shansi Province was expanded by about 5 to 10 percent. The Huaipei combine in Anhwei Province has more than 10 pairs of modern shafts and since 1968 reportedly has increased output by more than 20 percent yearly.[15] During 1971, East PRC's largest coal washing plant was being built in Anhwei Province. The Hsuchou combine in Kansu Province was still being built, the latest major facility completed being a 600,000-ton-per-year coal-washing plant at the Chiaho mine.[16] The Old Pinghsiang combine in Kiangsi Province met targets for the fourth year in a row and reportedly topped 1970 output by about 10 percent. The Peiping anthracite combine and the Tzupo combine in Shantung Province achieved targets. New reserves were found at Chinghsing, Hopeh, giving the combine another lease on life. Shih-chuai-shan in Ninghsia Province has finally been built into a medium-sized coal combine.

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[13] Mining Engineering. Coal in China is Bursting at the Seams. V. 23, No. 9, September 1971, pp. 68–70.

[14] New China News Agency (International Service in English; Peiping). Dec. 28, 1971.

A significant thrust was made in 1971 to expand small and medium coal mines. Kirin Province was credited with five medium coal mines, headed by Tunghua. In Hopei Province 250 small coal mines were said to have produced a total of 4.5 million tons of coal in 1971. Kansu Province's production was raised by about one quarter over the previous year. South of the Yangtze River, output from small coal mines increased 15 percent over that of 1970. Kwangtung and Szechuan Provinces, already producing several million tons or more annually, reportedly raised coal production by about 40 percent in 1971. Yunnan and Kwangsi Provinces together produce approximately 2 million tons of coal yearly, all from small mines. In the southern part of Kiangsu Province, many small coal mines were being developed and their combined output was nearly twice as much as that of 1970.

Coal mining in the PRC is advanced in the larger mines. Mining design and research institutes responsible for developing coal mines and washing plants are located in Peiping, Shanghai, Shenyang, Sian, Wuhan, and Chusan. The Peiping Institute is most prominent since overall planning and policy originate there. The Shanghai Institute specializes in machinery design. The Coal Mining Institute at Chusan, Anhwei Province, is a new establishment related to the Huainan coal combine.

During 1971 between 850 and 950 cubic feet of timber for supports were said to be required annually for each one thousand tons of coal mined. This meant about 350 million cubic feet of lumber, which represented an enormous effort for supports alone. A great deal of work was done to develop substitutes for the wood, an attempt to use bamboo reinforced concrete was only partially successful.

Coal in the PRC could possibly be the basis of a huge chemical industry if other fuels could be obtained in quantity. During 1971 quite a bit of nitrogenous fertilizer and methanol were manufactured from coal, but these were only the beginning of the potential petrochemical output that could develop if there were sufficient facilities.

The major problems of the PRC coal industry included making available more and better mining machinery; obtaining higher government priority for coal mining; improving railroads and other transportation to move the coal; and increasing the availability of timber for supports.

Petroleum and Natural Gas.—According to the Chinese,[17] the PRC's 1971 production of crude oil and that of natural gas was 16 and 25 percent respectively, above the 1970 levels and both production's topped the year's plan. Excluding shale oil, this would mean an output of possibly 25 million metric tons in 1971 (roughly equals 500,000 barrels per day). The PRC's oil reserves may be on the order of 15 billion barrels.

The main thrust of expansion was at Taching, but much exploration and drilling were done in the Karamai, Yumen, Tsaidam, and other oilfields. There was no news on offshore and coastal activities. Capital construction was pushed. New oil wells and refineries went into operation at most centers. Compared with 1970 figures, oil drilling capacity of the PRC reportedly rose by 17 percent and crude processing capacity by 16 percent. Output of various petroleum products increased considerably over that of 1970, and product quality and variety greatly improved. Many chemical and related products were being produced. Construction in the petrochemical area continued.

Possibility of more technical exchanges with foreigners appeared to be promising.

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[15] Ta-Kung-pao (Peiping). Mar. 27, 1972, p. 3.

[16] Jen-min Jih-Pao (Peiping). Aug. 3, 1972, p. 3.

[17] New China News Agency (International Service in English; Peiping). Jan. 9, 1972.

There were exchanges of oil delegation visits with Iraq in June and December. Chinese oil study groups were planning to make visits to Iran and Canada. Discussions and exchanges with the Japanese were in the offing.

The PRC's premium petroleum field—Taching in Manchuria—achieved new successes in all areas, with crude and refined oil production registering more than 25-percent gains over that of 1970. This means that output may have been 12 to 13 million tons in 1971. Targets for refined petroleum products were met 2 weeks ahead of schedule. Two drilling teams drilled in excess of 100,000 meters during the year. Taching's overall reserve position was improved. Many workers and much equipment were sent from Taching elsewhere to develop new oilfields. Surplus crude oil was shipped to Shanghai, Fushun, Dairen, Lanchow, and Maoming for refining, even though the local refinery was doubled in capacity in recent years. A petrochemical complex was also planned.

A great upsurge was noted for the Karamai field in Sinkiang Province. After recovering from the effects of the Cultural Revolution, Karamai's production of crude oil showed sharp gains, reaching possibly 4 to 5 million tons in 1971. The drilling program for delineating new reserves was ahead of schedule. Although the local refinery and the nearby Tushantzu refineries were worked full scale, surplus crude had to be shipped elsewhere for refining.

The old Yumen oilfields, headed by Shihyukou and Yaerhsia, again met production quotas, but the amount produced probably was no more than the 3 million tons estimated for 1970. The small local refinery cannot handle this crude and most of the surplus goes to the Lanchow refinery, also in Kansu Province. Lanchow has an annual capacity of 3 million tons, producing many petroleum and chemical products. A petrochemical machinery plant has been built in Lanchow also.

Shanghai's oil refinery, about the size of the one in Lanchow, apparently has been stabilized in production. Another refinery at Dairen, known as the Talien No. 7 plant, has been modernized by cutting space, fuel, and labor requirements, and capacity was nearly doubled.[18] A 2.5- to 3-million-ton refinery and petrochemical complex was being built in Peiping, with scheduled completion in 1973. A new refinery unit was also being installed at the Chin-hsi No. 5 plant in Liaoning Province. Nothing was said about a refinery in Nanking.

Tsinghai Province has become a stabilized producer, with the Tsaidam oilfield located more than 10,000 feet above sea level. Discovered more than a decade ago, it was not until recently that substantial reserves were delineated. A refinery of unknown size has also been built. Tsaidam's production target was fulfilled 3 months ahead of schedule, and prospects are that output will be further expanded in the near future.

Another new Chinese oilfield has been mentioned in the press.[19] According to this source, Japanese experts believe that the PRC has made large petroleum strikes in the Yellow River Delta near Li-ching and has been producing sizable quantities of crude oil there since 1966. Limitations in exploration equipment and know-how have been holding back production. The PRC's offshore areas near the Yellow River Delta also hold good promise for extensive oil discoveries and Japanese and international oil companies were interested in offering their services for development.

Shale Oil.—The Fushun shale oil operation in Manchuria showed little change from the previous year, producing about 2 million metric tons of oil in 1971. Fushun also has another conventional crude oil refinery.

The PRC's second shale oil operation, namely Maoming (or Mowming) in Kwangtung Province, however, continued to expand.[20] During the last 3 years, crude oil capacity rose here 2.5 times and refining capacity doubled. Output value in 1970 reportedly was 31 percent higher than in 1969, and that of 1971, 25 percent above that of 1970. Around 1960, Maoming had only two retorts. The third was not built until 1969 and by yearend 1971, there were at least five such retorts and enough equipment to build a sixth. The Maoming enterprise probably produces between 2 and 3 million tons of oil products annually.

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[18] Jen-min Jih-pao (Peiping). Jan. 12, 1972, p. 2.

[19] Washington Post (Washington, D.C.). Feb. 18, 1972, p. 24.

[20] New China News Agency (International Service in English; (Peiping). Feb. 8, 1972.

Total petroleum production from Chinese shale was estimated at 96,000 barrels per day (4.8 million metric tons per year) in 1971.

The Mineral Industry of Colombia

By Gordon W. Koelling[1]

The overall performance of Colombia's mineral industry during 1971 was impeded by a slight decline in crude oil production in comparison with the peak output of the previous year. Other sectors of the country's minerals industry displayed a mixed performance. Coal continued to be the most valuable nonpetroleum mineral product, probably followed by emerald. Colombia, the world's principal source of emerald, ranked among the top 10 gold producers, and was one of the few producers of platinum.

During July 1971, the Colombian Government signed a loan agreement with the U.S. Agency for International Development (AID) that provided for assistance in the investigation of Columbia's mineral resources by expanding an existing mineral survey program to additional areas of the country. This was the second mineral resources survey loan awarded to Colombia by AID. The first such loan, signed in 1963, provided funds to increase the country's capacity to carry out geological research and to determine areas most likely to contain substantial mineral deposits suitable for commercial extraction. The new agreement will facilitate the continuation of these programs, especially the investigation of potential resources in the southern part of the country.

In December 1971, the lower chamber of the Colombian Congress approved a bill that would have major implications for the private petroleum industry but the Senate did not act on the measure prior to the adjournment of its 1971 session. Should the Senate approve the bill in its 1972 session, it would go to the President for signature. A major provision of this bill would, after a 5-year transitional period, reserve all future exploration and production responsibilities in areas not presently covered by concession agreements for the Government-owned oil company, Empresa Colombiana de Petróleos (ECOPETROL). However, ECOPETROL would be authorized to enter into joint ventures with private foreign or domestic firms in carrying out its exclusive responsibilities. Another section of this bill declares that refineries, pipelines, and service stations are public service facilities, which are to be operated by ECOPETROL. Unlike the provision concerning exploration and production, this provision would also apply to existing facilities, which ECOPETROL would be empowered to purchase. ECOPETROL would also be allowed to participate with other firms in the operation and construction of such facilities. The arbitration procedures set forth in the present petroleum law to resolve differences between the Government and the private companies would be eliminated by this legislation.

PRODUCTION

Output of mineral fuels, especially crude oil and coal, declined during 1971, and the performance of the metals and nonmetals sectors of the Colombian minerals industry was mixed. Production of some items including crude steel, and cement increased; however, the output of important items such as gold, silver, platinum, lead, and zinc declined.

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[1] Geographer, Division of Fossil Fuels.

Table 1.—Colombia: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1969	1970	1971 [p]
METALS			
Chromite gross weight	160	170	500
Copper mine output, metal content [e]	7	50	56
Gold...troy ounces	218,872	201,500	188,842
Iron and steel:			
Iron ore and concentrate...thousand tons	352	543	442
Pig iron...do	[r] 195	231	197
Crude steel...do	[r] 272	310	[e] 330
Lead mine output, metal content	409	293	205
Manganese ore, gross weight	550	464	450
Mercury...76-pound flasks	344	215	213
Platinum group...troy ounces	27,805	26,358	25,610
Silver [2]...do	77,136	75,581	66,667
Zinc mine output, metal content	[r] 164	156	112
NONMETALS			
Barite	12,242	6,821	5,790
Cement, hydraulic...thousand tons	2,408	2,757	2,942
Clays:			
Kaolin (including china clay)	88,000	92,610	96,575
Other	555,100	616,050	670,000
Diatomite	15,976	280	300
Feldspar	22,050	23,152	24,836
Fertilizer materials, crude, phosphate rock	10,000	12,000	[e] 12,000
Gem stones, emerald...thousand carats	[2] 659	[2] 60	672
Gypsum...thousand tons	[r] 121	151	182
Lime [e]...do	1,000	1,000	1,000
Mica, all grades	17	26	32
Salt:			
Marine...thousand tons	344	532	300
Rock...do	334	230	338
Total...do	678	762	638
Stone:			
Dolomite...do	13	(3)	14
Limestone...do	4,258	5,007	NA
Marble...cubic meters	100	2,850	14,380
Quartzite [4]...thousand tons	158	165	172
Sulfur:			
From ore	[e] 26,900	[e] 29,900	[e] 30,500
Petroleum refinery byproduct	[e] 3,800	[e] 3,600	[e] 3,500
Total	[e] 30,700	[e] 33,500	[e] 34,000
Talc, soapstone, and pyrophyllite	1,525	1,723	1,975
MINERAL FUELS AND RELATED MATERIALS			
Coal, all grades...thousand tons	3,317	[e] [r] 3,200	2,800
Coke, all types...do	465	498	490
Gas, natural:			
Gross production...million cubic feet	103,882	104,894	111,288
Marketed production...do	44,767	46,736	51,186
Natural gas liquids...thousand 42-gallon barrels	4,006	4,510	3,629
Petroleum:			
Crude oil...do	76,776	79,594	78,101
Refinery products: [5]			
Aviation gasoline...do	619	558	481
Motor gasoline...do	14,338	16,002	16,357
Jet fuel...do	1,085	1,292	1,482
Kerosine...do	3,147	3,552	3,360
Distillate fuel oil...do	6,843	6,769	7,734
Residual fuel oil...do	15,633	16,352	[e] 18,600
Lubricants...do	467	499	268
Other:			
Liquefied petroleum gas...do	1,216	1,651	1,499
Naphtha...do	2,117	1,731	1,338
Asphalt and bitumen...do	1,676	1,576	618
Petroleum coke...do	825	870	[e] 900
Miscellaneous and unspecified...do	1,847	2,378	[e] 3,140
Total...do	49,813	53,230	56,777

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, carbon black, manufactured fertilizers, coal briquets, and magnesite are also produced, but the level of output is unknown.

[2] May include gem stones other than emeralds.

[3] Less than ½ unit.

[4] Erroneously reported as including quartz and glass sand in previous editions; data are for quartzite only.

[5] Includes refinery fuel and unfinished oils destined for interrefinery transfer and further processing.

TRADE

Shipments of crude oil, Colombia's principal mineral export item, increased moderately. Exports of coal more than doubled, and shipments of platinum and ammonia also rose sharply. A majority of imported mineral items registered increases; the rise in iron and steel was the most significant.

Table 2.—Colombia: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity[1]	1969	1970	Principal destinations, 1970
METALS			
Aluminum metal including alloys, all forms	399	210	Ecuador 137; Nicaragua 64.
Chromium, chromite	27	3	All to Mexico.
Copper:			
Ore and concentrate	139	544	Mainly to Japan.
Metal including alloys	750	440	Denmark 292; Sweden 91.
Gold:			
Ore and concentrate	72	31	All to Sweden.
Metal unworked troy ounces	129	225	Mainly to United States.
Iron and steel metal including alloys, all forms	826	1,261	Ecuador 500; United States 365.
Lead:			
Ore and concentrate	550	1,119	Mainly to United States.
Metal including alloys	1	3	Mainly to Venezuela.
Mercury 76-pound flasks	21	--	
Platinum group, platinum partly worked troy ounces	r 27,575	34,176	All to United States.
Zinc:			
Ore and concentrate	--	286	All to Japan.
Metal including alloys	363	255	Ecuador 213; Belgium-Luxembourg 41.
Other:			
Ore and concentrate	146	198	Japan 155; Sweden 43.
Ash and residue containing nonferrous metal	--	35	Mainly to Belgium-Luxembourg.
Other metal	--	25	All to Japan.
NONMETALS			
Barium sulfate	454	455	All to Ecuador.
Cement	278,185	248,671	Puerto Rico 70,867; Brazil 51,816; Martinique 26,996; Guadeloupe 23,827; Netherlands Antilles 23,650.
Clays and products (including all refractory brick):			
Crude, kaolin and other clays	10	1	Mainly to Venezuela.
Products, refractory	152	657	Mainly to Peru.
Diatomite and other infusorial earths	20	100	All to Netherlands.
Fertilizer materials:			
Crude	1	5	All to Venezuela.
Ammonia	25,473	36,886	Costa Rica 19,340; Venezuela 10,192.
Gypsum and plasters	NA	23	All to Ecuador.
Precious and semiprecious stones, except diamond kilograms	659	60	Mainly to United States.
Stone, sand and gravel:			
Gravel and crushed rock	--	293	Netherlands Antilles 86; Dominican Republic 80; Puerto Rico 65.
Sand	--	425	All to Ecuador.
Sulfur, all forms	r 104	111	Ecuador 51; Peru 44.
Talc, steatite	10	10	Mainly to Venezuela.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	5,114	5,769	Peru 2,872; Chile 1,482.
Coal and coke, all grades	3,689	8,802	Belgium-Luxembourg 5,500; Japan 2,418.
Petroleum:			
Crude [2] thousand 42-gallon barrels	29,853	31,246	United States 15,185; Chile 5,778; Ecuador 5,188.
Refinery products:			
Gasoline and naphtha	475	--	
Distillate fuel oil	1,399	1,513	Mainly to United States.
Residual fuel oil	9,893	9,014	United States 7,688; Peru 1,101.
Other	(3)	3	Mainly to Ecuador.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	r 33,957	5,174	Mainly to Saudi Arabia.

r Revised. NA Not available.

[1] In addition to the reported commodities, Colombia is known to export gold, silver, and emeralds, but data are not available concerning shipments of these items.

[2] Includes small quantities of natural gas liquids mixed with crude oil.

[3] Less than ½ unit.

Table 3.—Columbia: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum:		
Bauxite and concentrate	4,600	1,472
Oxide (alumina) and hydroxide	954	923
Metal including alloys:		
Ingots, castings, and scrap	8,005	8,050
Semimanufactures	2,973	1,912
Antimony including alloys	11	7
Chromium, chromite	--	27
Copper metal including alloys, all forms	4,420	6,939
Iron and steel:		
Ore and concentrate	--	293
Metal:		
Pig iron and scrap	12,097	14,437
Ferroalloys	3,472	3,747
Steel, primary forms	71,471	80,861
Semimanufactures	244,623	288,883
Lead:		
Oxides	936	1,997
Metal including alloys, all forms	2,339	2,552
Magnesium including alloys, unwrought	r 29	21
Manganese ore and concentrate	--	50
Mercury 76-pound flasks	r 343	87
Nickel:		
Metal including alloys, unwrought	8	3
Semimanufactures	209	234
Platinum-group metals troy ounces	60,980	11,639
Silver including alloys do	r 4,565	3,256
Tin metal, including alloys, all forms long tons	336	182
Zinc metal, including alloys, all forms	5,607	5,952
Other:		
Ores and concentrate	99	315
Other base metals, n.e.s	19	9
NONMETALS		
Abrasives, natural, n.e.s.:		
Crude	171	95
Grinding stones and wheels	53	56
Asbestos, crude	12,187	16,763
Barite and witherite	2	3,506
Boron materials, refined borax	266	419
Cement	351	704
Chalk	NA	1
Clays and products:		
Crude n.e.s.:		
Bentonite	2,889	2,165
Kaolin	2,484	3,862
Other	38	145
Products:		
Refractory	1,372	3,130
Nonrefractory	NA	409
Cryolite	5	--
Diatomite and other infusorial earths	1,312	1,362
Fertilizer materials manufactured:		
Nitrogenous	8,634	21,046
Phosphatic	67,608	38,219
Potassic	61,925	61,835
Other including mixed	16,609	26,470
Fluorspar	NA	15
Graphite, natural	50	79
Gypsum and plasters	22,071	10,990
Lithium mineral	216	162
Magnesite	71	66
Mica, all forms	36	78
Pigments, mineral	817	669
Precious and semiprecious stones, except diamond kilograms	56	66
Salt	10	13,263
Sodium and potassium compounds n.e.s	19,103	29,291
Stone, sand and gravel	4,651	2,410
Sulfur	r 2,627	113
Talc, soapstone, pyrophyllite	1,391	1,270
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	153	87
Carbon black	428	399
Coal, including briquets, all grades	7	14

See footnotes at end of table.

Table 3.—Colombia: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970
MINERAL FUELS AND RELATED MATERIALS—Continued		
Petroleum refinery products:		
Gasoline thousand 42-gallon barrels	463	21
Kerosine and jet fuel do	22	35
Distillate fuel oil do	15	19
Residual fuel oil do	--	172
Lubricants do	122	97
Gas, hydrocarbon do	1	2
Mineral jelly and wax do	161	192
Other do	107	165
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	r 4,218	1,402

r Revised. NA Not available.

Source: Official customs returns of Colombia.

COMMODITY REVIEW

METALS

Gold.—Gold production continued to decrease for the seventh consecutive year although the rate of decline was less severe than in the past. The 6 percent drop in output during 1971 resulted primarily from a decline in the placer mining activities of small independent operators. Almost 76 percent of the year's total gold production was accounted for by five companies. Four of these firms were wholly owned subsidiaries of the International Mining Corp. (United States), which also owned a controlling interest in the fifth, Pato Consolidated Gold Dredging, Ltd.

The 1971 output of gold by wholly owned subsidiaries of International Mining increased 7 percent to 82,612 troy ounces. Of this total, 46,148 troy ounces were from the country's only significant underground gold mining operation at Frontino. The 8 percent decline in this mine's production, in comparison with that of the previous year, resulted from the continuing failure of an expansion program initiated in 1964 to develop sufficient new high-grade reserves to support previous production levels at current prices. Placer mining operations of International's wholly owned subsidiaries resulted in the dredging of 19.9 million cubic yards of materials from which 36,464 troy ounces of gold were recovered, a 37 percent increase for the year. This large rise in gold output resulted from a 13 percent increase in the quantity of materials dredged and a 17 percent rise in the average gold content of these materials.

Pato Consolidated Gold Dredging, Ltd., operated four dredges, which dredged 17.8 billion cubic yards during the year. Almost 62,000 troy ounces of gold were recovered from this material. The 2 percent decline in production during 1971 resulted from the time lost in moving two dredges to new locations and the shutdown of another dredge for 21 days for general repairs.

Iron and Steel.—Acerías Paz del Rio, S.A., continued to be Colombia's dominant iron and steel producer during 1971. It produced all of the country's pig iron from iron ore produced at its own mine and from sizable quantities of fines withdrawn from its large stockpile. These fines provided part of the feed for the company's ore-sinterization and oxygen-blasting facilities. The company also accounted for a major portion of Colombia's crude steel output.

Nickel.—Work probably was initiated during 1971 on the Cerro Matoso ferronickel project which will be the largest mining venture in Colombia's history. This project will be carried out by Compañia de Niquel Colombiano, S.A., which is owned jointly by the Instituto de Fomento Industrial (IFI), Hanna Mining Co., and Chevron Oil Co. Each of the parent entities is to contribute one-third of the investment required for the project, but the Government-owned IFI has a 50 percent voting interest.

The lateritic nickel deposit involved in this project is located in the Montelibano district of the Department of Córdoba. Plans call for the exploitation of this deposit by open pit methods. A smelter to be constructed adjacent to the mine probably will have an annual capacity of approximately 25,000 tons of ferronickel ingot (nickel content only) instead of 17,000 tons as originally planned. Production may be delayed until 1977 as a result of technical problems and the likely decision to increase the planned capacity of the smelter.

NONMETALS

Asbestos.—It was announced in late 1971 that design work for the Las Brisas asbestos project in the northern part of the Department of Antioquia had been assigned to the General Engineering Co. of Toronto, Canada. The Las Brisas asbestos mining and milling facilities are to be operated by Asbestos Colombianas, S.A., in which Nicolet Industries, Inc., of Ambler, Pa., holds a 70 percent interest. This project is to be designed for the mining and processing of 36,000 to 63,000 tons of ore annually.

Cement.—Work was in progress during the year to increase the daily output of the Cementos Diamante, S.A., plant at Ibaqué from 700 to 1,000 tons.

Fertilizer Materials.—Recent discoveries of phosphate rock have led to the initiation of a program by IFI to develop local production in order to replace phosphate imports costing an estimated $20 million [2] annually. The first step under this program was the development of a project for the exploitation of the Turmeque deposits near Ventaquemada in the Department of Boyacá by Compañia Colombiana de Minas (COLMINAS), a dependency of IFI. A 60,000-ton-per-year superphosphate plant being constructed under contract by Pan American Consulting, Ltd., as a part of this project probably was nearing completion at yearend 1971.

Similar exploitation projects were being considered in connection with phosphate rock deposits in the Sardinata and Azufrada areas in the Department of Santander, the Sogamosa area of the Department of Boyacá, and at several locations in the Department of Huila.

An initial annual output of 200,000 tons of ammonium fertilizer is expected as a byproduct of the operations of the Monómeros Colombo-Venezolano caprolactam plant inaugurated at Barranqilla in November 1971. Byproduct fertilizer output from this plant is expected to eventually reach 300,000 tons annually.

Salt.—Development of a marine salt production and export complex at Bahía Hondo on the Guajira Peninsula was in progress during 1971. This complex is to have an annual output capacity of 1.5 million tons of salt and is scheduled for completion during 1973.

MINERAL FUELS

Coal and Coke.—Early in 1971, IFI requested the submission of proposals from firms interested in the development of the coal deposits at El Cerrejon in the Department of Guajira. Recent test drilling of these deposits indicates reserves of 50 to 100 millions tons of low-sulfur, steam-grade, noncoking coal. Strip mining methods would reportedly be economical for 10 to 15 years but part of the reserves would be recoverable only by underground mining.

Acerías Paz del Rio, S.A., continued to be Colombia's principal producer and consumer of metallurgical coke. It was also the operator of the country's only major coal washery.

Petroleum and Natural Gas.—Total output of crude oil declined 2 percent during 1971 as the decrease in aggregate production from the country's older producing areas more than offset a 9 percent increase in output from the recently developed Putumayo area fields. Expansion of production from the Putumayo fields, owned by Gulf Oil Co. and Texas Petroleum Co. (TEXPET) and operated by the latter, was curbed as the result of a dispute between the Ministerio de Minas y Petróleos and TEXPET concerning the maximum efficient rate of production at Orito, the area's principal field. The Ministerio maintained that one-half-inch chokes should be installed in the producing wells of the Orito field to limit the rate of production for conservation purposes in order to guarantee maximum crude oil recovery from the field while TEXPET insisted that this step was not necessary. Output from the Putumayo area was held to a compromise level of 65,000 barrels per day during much of the year pending resolution of this dispute by an arbitration tribunal.

Natural gas production, which rose 6 percent during 1971, was primarily from

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[2] Where necessary, values have been converted from Colombian Pesos (CP) to U.S. dollars at the rate of CPs 17.60 = US$1.00.

Table 4.—Colombia: Salient statistics of the petroleum and natural gas industry

		1969	1970	1971
Crude oil:				
Production	thousand 42-gallon barrels	76,776	79,594	78,101
Delivered to refineries	do	46,565	49,030	53,048
Exported	do	29,853	31,246	[e] 24,000
Natural Gas:				
Production	million cubic feet	103,882	104,894	111,288
Consumption [1]	do	44,767	[r] 56,736	51,186
Injected [2]	do	37,421	38,150	37,075
Flared	do	21,694	20,008	23,027
Natural gas liquids:				
Production	thousand 42-gallon barrels	4,006	4,510	3,629
Consumption [3]	do	[e] 2,200	[e] 2,500	[e] 2,500
Delivered to refineries	do	1,519	1,706	[e] 900
Exported, mixed with crude oil	do	[e] 220	[e] 230	[e] 220
Refinery products:				
Refinery output [4]	do	49,813	53,230	56,777
Consumption [5]	do	32,005	35,396	37,462
Unfinished oils rerun following interrefinery transfer	do	1,449	1,844	[e] 2,000
Exported	do	11,767	10,558	[e] 10,000

[e] Estimate. [r] Revised.

[1] Includes shrinkage at natural gas processing plants, and oil company use for fuel.

[2] Includes small quantities used for gas-lift operations.

[3] Excludes the propane and butane output of refineries.

[4] Includes refinery gains and quantities used for fuel.

[5] Excludes propane and butane produced at refineries, and most oil company use.

Source: Centro de Información de la Industria Petrolera.

oilfields where, in a number of cases, gas oil ratios have been rising steadily in conjunction with reservoir depletion. Output of natural gas liquids declined 20 percent during the year.

Proved reserves of crude oil reportedly totaled 1,663 million barrels at yearend 1971. As of the same date, proved reserves of natural gas were reported at 2,500 billion cubic feet.

In accordance with the authority granted it by Law 20 of 1969, the Government-owned oil company ECOPETROL signed joint-venture contracts with private firms during 1971 for the exploration and development of its large petroleum reserve area in the northeastern part of the Llanos Orientales (eastern plains). Contracts covering three of the nine sites or blocks available were signed with a partnership comprised of Continental Oil Co. and Shell Oil Co. (U.S.-based member of the Royal Dutch/Shell Group). Another three blocks were awarded to International Petroleum Colombia, Ltd., (INTERCOL), and one block each was assigned to BP Colombia, Inc., and the Superior Oil Co. of Colombia in partnership with Sun Oil Co. and Signal Companies, Inc.

Under the terms of these joint-venture contracts, the private companies are required to undertake stipulated minimum levels of exploration investment at their own expense. The contracts provide for an initial exploration period of 3 years, renewable for 3 years, and under special circumstances the total exploration period of 6 years could be extended. If oil or gas is discovered, the private company will make the decision as to the feasibility of commercial production. Upon determination that a discovery is commercial, an operations committee is to be formed, with the private contractor and ECOPETROL each having an equal voice in management decisions. Both parties will also share in the costs, equity, and profits relating to the development and production of the field. The development and production period provided for in the contracts is 25 years, unless the exploration period extends beyond 6 years in which case the total length of the exploration and development periods may not exceed 31 years.

Japanese interests became involved in their first petroleum exploration venture in Columbia during early 1971 when Colombia Oil Co., Ltd., a consortium of three Japanese oil firms, acquired a 50 percent interest covering a part of the offshore concession acreage held by Colombia Gulf Oil Co. The area covered by this agreement totals 485,000 acres in eight tracts located in the Golfo de Morrosquillo, approximately 95 kilometers southwest of Cartagena.

A long-standing dispute between an affiliate of the Petroleum Workers Federation (FEDEPETROL) and the Colombian Petroleum Co. (COLPET), owned jointly by Mobil Oil Corp. and Texaco, Inc., involving a number of issues, including the company's use of contractors, culminated during May 1971 in the appointment of a committee of inquiry by the Ministerio de Minas y Petróleos. This committee reported a number of alleged concession contract violations on the part of COLPET. Subsequently, the Ministerio issued a resolution requiring COLPET to correct the alleged violations or face termination of its concession. The resolution required, among other things, that COLPET perform all normal work with its own equipment and employees, maintain all roads within the concession area except those to officially abandoned wells, and submit data concerning its activities, including projected investment for the remaining 10 years of the concession agreement. Negotiations between the Ministerio and COLPET, which followed issuance of the resolution, were still in progress at yearend. Chances of a settlement appeared centered on the possibility that ECOPETROL, the Government petroleum entity, would obtain participation in COLPET operations. This would be achieved by the transfer of Mobil's interest and obligations with respect to COLPET to ECOPETROL.

The combined footage of exploratory and development drilling continued to decline during 1971 although the total number of wells drilled rose sharply. Data on drilling activity and results were as follows:

	1970	1971
Wells drilled:		
Exploratory:		
Oil--------number--	3	11
Dry----------do----	15	10
Subtotal---do----	18	21
Development:		
Oil-----------do----	39	57
Gas----------do----	1	--
Dry----------do----	2	--
Subtotal---do----	42	57
Total------do----	60	78
Footage drilled---------feet--	404,898	354,100

A new 27,000-barrel-per-day crude oil distillation unit was placed on stream at ECOPETROL's Barrancabermeja refinery in May 1971. The addition of this unit raised the refinery's rated crude throughput to 110,000 barrels per day. Installation of a paraffin unit was probably also completed during the year.

Production at the Barrancabermeja refinery was interrupted in early August by a short strike that involved the takeover of the plant by the workers. Damage to plant facilities, which occurred during the worker occupation, prevented the refinery from returning to full-scale production until the end of the month. As a consequence, severe gasoline shortages were experienced in many parts of the country, especially in the Bogotá area.

The special exchange rate of Col $9 per US$1.00 at which private oil companies and ECOPETROL were required to sell 25 percent and 100 percent, respectively, of their crude oil output to domestic refineries for pesos (all oil transactions in Colombia between producers and refiners are quoted in terms of U.S. dollars per barrel) was eliminated by the Government in June 1971. In its place, an exchange rate of Col$20 per US$1.00 was set for all Colombian crude sold to domestic refineries. At the same time the Government lowered the dollar price for crude oil sold to refineries by private producers, thus neutralizing the effect of the higher exchange value on private producer profits. The net effect of these actions was the elimination of foreign exchange subsidies to refineries and a consequent increase in the cost of refinery operations and in the retail price of most petroleum products.

Plans were under consideration at yearend 1971 for the construction of two additional refineries to be operated by ECOPETROL. The largest of these plants, with a planned capacity of 70,000 barrels per day, is to be located at Tumaco. The other, to be constructed at Cali, is expected to have a capacity of 40,000 to 50,000 barrels per day.

Construction of ECOPETROL's aromatic hydrocarbons plant, located adjacent to the Barrancabermeja refinery, was completed in mid-1971. Processes used in this plant were licensed by the Universal Oil Products Co. of Des Plaines, Ill. Among the processes involved are platforming and sulfolane extraction for the production of high-purity nitration-grade aromatics, hydeal hydrodealkylation for the catalytic conversion of toluene and/or xylenes to benzene, and hydrar hydrogeneration for the catalytic saturation of benzene with hydrogen to produce equivalent purity cyclohexane. Annual production capacity of this plant is 23,000 tons of benzene, 20,000 tons of toluene, and 36,000 tons of xylenes.

The Monómeros Colombo-Venezolano caprolactam plant at Barranquilla was inaugurated in November 1971. IFI and ECOPETROL have a 25-percent and 20-percent share, respectively, in this joint Colombian-Venezuelan venture. A 45-percent interest is owned by Instituto Venezolano de Petroquimica (I.V.P.), a Venezuelan Government-owned company, and the remaining 10 percent is owned by a Netherlands firm. Principal feedstocks for this plant are cyclohexane from ECOPETROL's Barrancabermeja aromatic hydrocarbons complex and ammonia from an I.V.P. plant in Venezuela. Initial annual capacity of the Monómeros plant was 10,000 tons of caprolactam and 200,000 tons of byproduct ammonium fertilizer, but output is expected to eventually reach 11,500 tons of caprolactam and 300,000 tons of fertilizer annually.

Table 5.—Colombia: Summary data on companies producing and/or refining crude oil during 1971

Company	Principal ownership or affiliation	Nationality of ownership	Crude oil production during 1971 (thousand 42-gallon barrels)	Refining capacity as of Dec. 31, 1971 (thousand 42-gallon barrels daily)
Antex Oil and Gas Co., Inc.	Petroqumíca del Atlántico and U.S. citizens.	Colombian/United States.	2	--
Chevron Petroleum Co. of Colombia.	Standard Oil Co. of California.	United States	9,177	--
Colombia-Cities Service Petroleum Corp. (COLCITCO).	Cities Service Co	do	3,216	--
Colombian Petroleum Co. (COLPET).	Mobil Oil Corp. and Texaco Inc.	do	5,938	4
Empresa Colombiana de Petróles (ECOPETROL).	Colombian Government	Colombia	9,633	110
International Petroleum Colombia, Ltd. (INTERCOL).	Standard Oil Co. (New Jersey).	United States	--	56
Provincia Petroleum Co.	International Petroleum Colombia, Ltd. and British Petroleum Co., Ltd.	United States/ British.	8,561	--
Shell-Condor, S.A.	Royal Dutch/Shell Group	British/Dutch	6,903	--
Tennessee Colombia, S.A. (TENNECOL).	Colombian citizens and Southdown, Inc.	Colombian/United States.	757	--
Texas Petroleum Co. (TEXPET).	Texaco, Inc	United States	8,511	2
Texas Petroleum Co. and Colombia Gulf Oil Co.	Texaco, Inc. and Gulf Oil Corp.	do	25,403	1
Total			78,101	173

The Mineral Industry of Cyprus

By E. Shekarchi[1]

In spite of the delicate and sometimes tense political situation of the last decade, the economy of Cyprus has remained remarkably buoyant. The per capita gross national product (GNP) has risen from $320[2] in 1960 to $768 in 1971. Minerals, principally copper, chromite, and asbestos, have contributed generously to the strength of the economy, providing approximately 30 percent of the total value of exports from the island in 1971, a slight decrease from the 31 percent recorded in the previous year. The Government's new 5-year economic plan, 1972 thru 1976, envisions an annual growth rate of nearly 8 percent for the overall economy.

By the end of 1971 the recommendations of the Common Market's Executive Commission to grant Cyprus associate membership in the European Economic Community (EEC) had not been acted upon. However, the EEC Council of Ministers did authorize its Commission to open final negotiations with Cyprus in 1972.

The Geological Survey Department, which is now administered by the Ministry of Agriculture and Natural Resources, carried out detailed geological mapping (1:5,000) in the north-central area of the Cyprus, where most mineral deposits occur. It also undertook consulting work with private companies to encourage the mining industries to conduct geological studies for metal, nonmetals, and ground waters.

An agreement was signed in June 1971 between the Bank of Cyprus and the Hungarian State Organization for Mineral and Geological Survey (Geominco) under which the dormant copper-pyrite mine at Troulli in the Larnaca district will be reactivated. Hungary is expected to invest about $3.6 million. Geominco will erect a copper processing plant and conduct prospecting in the Troulli area. The processing plant is scheduled for completion in July 1972.

PRODUCTION AND TRADE

The available data on mineral production and trade are given in the following tables:

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[1] Physical scientist, Division of Ferrous Metals.

[2] Where necessary, values have been converted from Cyprus pounds (C£) to U.S. dollars at the rate of C£1=US$2.40.

Table 1.—Cyprus: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1969	1970	1971 [p]
METALS			
Chromite ore and concentrate	23,921	33,335	[2] 42,951
Copper mine output, metal content [3]	17,233	18,161	[2] 18,588
NONMETALS			
Asbestos	21,706	25,625	[2] 22,612
Clays, crude:			
Bentonite [2]	9,181	13,101	[2] 12,564
Other (unspecified) [e] [4]	157,130	162,568	NA
Cement, hydraulic	242,601	270,471	310,390
Gypsum:			
Crude	[r] 22,518	35,125	[e] 40,000
Calcined [e] [4]	10,318	8,800	NA
Lime, hydrated [e] [4]	99,989	78,795	[e] 80,000
Mineral pigments:			
Terra verte [2]	11	13	NA
Umber	17,154	6,953	[2] 6,993
Yellow ocher [2]	[r] 564	451	NA
Pyrites:			
Gross weight	926,865	929,367	[2] 686,355
Sulfur content	437,151	450,741	332,882
Salt, marine	5,871	7,000	[e] 7,000
Stone, sand and gravel:			
Dimension stone, marble [e] [4]	39,500	43,802	NA
Crushed and broken building stone	365,220	878,487	NA
Sand and aggregate [e] [4] thousand tons	1,682	1,576	NA

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, a variety of other crude construction materials are also produced, but information is inadequate to make reliable estimates of output levels.

[2] Exports.

[3] Includes copper content of copper concentrates, cupriferous pyrite ore, and cement copper produced; excludes content of iron pyrite.

[4] Estimates from Annual Report of Senior Mines Officer, Republic of Cyprus, for 1969 and 1970.

Table 2.—Cyprus: Exports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum, scrap	8,486	136	Italy 94; Denmark 19.
Chromium, ore and concentrate	26,892	31,246	Austria 14,589; France 9,549.
Copper:			
Concentrate	63,788	53,862	West Germany 12,686; Spain 9,632.
Cement	9,563	11,137	All to West Germany.
Cuprous pyrite	86,019	96,049	West Germany 68,779, Netherlands 21,292.
Metal, scrap	32,897	2,284	Mainly to France.
Iron and steel:			
Scrap	6,699	6,480	Italy 4,621; Greece 1,859.
Semimanufactures, tubes, pipes and fittings.	472	340	Libya 200; Malta 139.
Lead, scrap	436	324	West Germany 282; Denmark 26.
Zinc, scrap	45	62	United Kingdom 35; Netherlands 20.
Other waste and scrap of base metals	29	3	All to Netherlands.
NONMETALS			
Asbestos, crude	19,144	24,133	Denmark 6,721; United Kingdom 6,653; Sweden 1,816; Lebanon 1,453; Arab Republic of Egypt 1,453.
Cement	--	20	All to Libya.
Clays and products, refractory	9,747	13,101	Israel 12,261.
Gypsum	9,025	4,421	Lebanon 4,405.
Lime	1,971	5,352	Libya 5,352.
Pigments, mineral	9,430	7,404	United States 4,390; United Kingdom 2,202.
Pyrites, unroasted	847,469	818,106	Italy 258,096; Netherlands 230,191; France 112,925.
Stone, gravel and crushed stone	1,380	1,400	Israel 953; Libya 447.

[1] Includes reexports.

Table 3.—Cyprus: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum including alloys, all forms	795	1,136
Copper:		
Copper sulfate (including alums) and persulfates	956	685
Metal including alloys, all forms	136	178
Gold including platinum-plated, unwrought and semimanufactures troy ounces	15,408	17,520
Iron and steel:		
Scrap	1	--
Pig iron (including cast iron) and ferroalloys	601	318
Primary forms	32	57
Semimanufactures	85,664	76,902
Lead:		
Oxides	108	196
Metal including alloys, unwrought and semimanufactures	174	263
Nickel including alloys, unwrought and semimanufactures	5	8
Platinum group and silver:		
Silver and platinum ores troy ounces	758	3,279
Metal including alloys:		
Platinum group do	23	4
Silver do	96,412	76,210
Tin, including alloys:		
Scrap long tons	3,465	3,640
Unwrought and semimanufactures do	r 380	282
Titanium oxides	69	63
Zinc:		
Oxide and peroxide	37	18
Metal including alloys, unwrought and semimanufactures	475	470
Other base metals, ore and concentrate	2	--
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc	318	26
Grinding and polishing wheels and stone value	$73,224	$70,140
Barite and witherite	483	246
Cement	42,374	27,131
Chalk	--	373
Clays and products (including all refractory brick):		
Crude, n.e.s	4,412	640
Products:		
Refractory (including nonclay bricks) value	$47,786	$97,894
Nonrefractory do	$428,376	$555,715
Diamond, gem not set or strung do	$16,774	$10,714
Diatomite and other infusorial earths	336	72
Fertilizer materials:		
Crude	22	28
Manufactured:		
Nitrogenous	42,017	44,713
Phosphatic	18,446	12,667
Potassic	910	863
Other, including mixed	25,884	44,600
Ammonia	15	20
Graphite, natural	--	3
Gypsum and plasters	869	272
Pigments, mineral:		
Natural, crude	282	242
Iron oxides, processed	19	18
Precious and semiprecious stones except diamond:		
Natural value	$5,818	$10,222
Manufactured do	$15,288	$8,794
Salt and brines	485	378
Sodium and potassium compounds, n.e.s	481	265
Stone, sand and gravel:		
Dimension stone	702	1,383
Gravel and crushed rock	35	78
Sand excluding metal bearing	46	24
Sulfur:		
Elemental, other than colloidal and other	608	1,799
Sulfur dioxide	55	46
Sulfuric acid, oleum	226	318
Talc, steatite, natural	115	518
Other n.e.s. building materials of asphalt, asbestos and fiber, cement	12,283	7,151
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	1,716	3,211
Coal including briquets, all grades	181	150
Coke and semicoke	623	218
Peat including briquets and litter	85	12
Petroleum:		
Crude thousand 42-gallon barrels	10	--
Partly refined do	1,219	4,024

See footnotes at end of table.

Table 3.—Cyprus: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity		1969	1970
Petroleum—Continued			
Refinery products:			
Gasoline (including natural)	thousand 42-gallon barrels	826	869
Kerosine and jet fuel	do	292	412
Distillate fuel oil	do	983	962
Residual fuel oil	do	1,570	1,665
Liquefied petroleum gas	do	211	214
Lubricants	do	44	48
Mineral jelly and wax	do	2	(1)
Asphalt and bitumen	do	r 19	11
Other nonlubricants	do	r 3	(1)

r Revised.

[1] Less than ½ unit.

COMMODITY REVIEW

METALS

Chromite.—Hellenic Mining Co., Ltd. (HMC), the only chromite producer on the island, had another profitable mining year in 1971, with production 28.8 percent higher than in 1970. Prospecting by an independent U.S. company and the Cyprus Geological Survey did not produce any significant findings. Most of the chromite output of Cyprus in 1970 was exported to Austria, and, most of the remainder was shipped to France.

Copper.—Cyprus Island Division of Cyprus Mines Corp. (CMC) continued its operation of the three open pit mines of Skouriotissa, Apliki, and Lefka. The company reduced the mining activities at Movrovouni mine owing to the depletion of high-grade sulfide ore. CMC is reportedly undertaking an investment program to finance expansion of the company's present concentration plant to recover copper from low-grade sulfide ores. Known reserves of low-grade ore (less than 1 percent copper) are sufficient to sustain a concentration program for at least a decade, according to officials of Cyprus Geological Survey.

The HMC continued to mine sulfide ore from the Kalavasos underground mine and the Mathiati and Meni open pit mines. Development and exploration work, which began in 1970, continued in Kokkinoyia copper mine, but no production figures or concentrate shipments were reported by the yearend. Other small producers, such as Cyprus Sulfur and Copper Co. and Kambia Mines, Ltd., were actively exploring for copper or pyrite ore during 1971; however, no significant find was reported.

Total copper production of Cyprus for 1971 increased over the 1970 output. Copper-cement dropped 17 percent, copper concentrates were up 3 percent, and cuprous pyrite decreased 26 percent.

NONMETALS

Asbestos.[3]—Asbestos production in Cyprus was virtually the same in 1971 as in 1970. Cyprus Asbestos Mines, Ltd. continued to be the most active asbestos producer in the country. Most of the asbestos produced in Cyprus during 1970 was shipped to Denmark and the United Kingdom. Sweden, Lebanon, and the Arab Republic of Egypt also received small shipments.

Cement.—Demands by the construction industry involved in building tourist facilities spurred production of cement in Cyprus during 1971 to an increase of 14.8 percent over that of 1970.

Pyrite.—Iron pyrite production decreased 29 percent in 1971 compared with that of 1970, due to a drop in copper prices and the availability of a large supply of sulfur in the international market.

MINERAL FUELS

Petroleum.—Exploration for petroleum was dormant in Cyprus during 1971.[4] The last wildcat well, Lefkoniko 1, was abandoned as a dry hole in March 1970. This well was drilled in the Tertiary Nicosia Basin by Forest Cyprus Corp., a subsidiary of Forest Oil Corp. of Bradford, Pa., and Industrija Nafte Zagreb (INA), a Yugoslav state oil agency, to a depth of 10,810 feet before it was plugged and abandoned.

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[3] Barklay International Review, London, March 1972, p. 27.

[4] Petroleum Times. V. 76, No. 1933, March 1972, p. 6.

By the end of 1971, four companies held concession rights covering a total area of 8,440 square kilometers on land and offshore. Forest Cyprus Corp. held 3,315 square kilometers in the Tertiary Nicosia Basin and offshore. A 50-percent interest of this concession was granted to INA. Offshore Exploration Oil Co. (OXOCO), of Philadelphia, Pa., held seven land and offshore concessions, covering a total area of 3,058 square kilometers. Bounty Oil, an Australian company, held a 45-percent interest in some of the OXOCO's offshore rights. Finally, Polyiros Kyriakides, an independent Cypriot company, held a very small concession of about 22 square kilometers northeast of Limassol.

A marine seismic survey, on behalf of OXOCO/Bounty, was completed in the early part of 1971 along the northern coast of Cyprus. Detailed information on the results of the survey was not available at yearend.

The construction of the only oil refinery, Cyprus Petroleum Refinery, Ltd., located at the port of Larnaca on the southern coast of Cyprus, was completed by the end of 1971. The refinery was expected to go on-stream at capacity by mid-1972. It will have a 13,000 barrel-per-day throughput. Shell Oil Co. has 25.5 percent of the shares and will manage operations. The other partners are British Petroleum Co. Ltd., 25.5 percent; Mobil Oil Corp., 34 percent; and Cyprus Government, 15 percent.

The Mineral Industry of Czechoslovakia

By Bernadette Michalski [1]

The Czechoslovakian economy, not yet recovered from the political and economic crises of 1968, did not attain most planned goals for 1971. Industrial production rose by 7.0 percent, falling far short of the planned 9.0 percent increase over 1970. Capital goods increased by 7.2 percent in 1971 as compared with 7.9 percent in 1970.

Significant developments in the mineral industry during the year included modernization activities in major iron and steel plants and rolling mills, construction of additional production units for mineral fertilizers, a record solid fuel output mainly attributable to increased mechanization, and the construction of an international pipeline for transport of natural gas from the U.S.S.R. through Czechoslovakia to East Germany, West Germany, Austria, and Italy.

PRODUCTION

Investments in the iron and steel industry yielded substantial increases in production. Crude steel output increased by 5 percent bringing total output to more than 12 million tons. Output of semimanufactures increased 29 percent, making available an additional 2 million tons for export.

The solid fuels industry sustained a yearly growth pattern of approximately 3 percent in the last 3-year period.

Table 1.—Czechoslovakia: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1969	1970	1971 [p]
METALS			
Aluminum ingot, primary only	35,000	31,000	37,000
Antimony:			
Mine output, metal content [e]	600	600	600
Metal	1,300	[e] 1,300	[e] 1,300
Cadmium [e]	200	200	220
Copper:			
Mine output, metal content	[r] 3,900	4,000	4,800
Blister	3,900	4,000	4,800
Metal including secondary	16,441	16,723	17,100
Iron and steel:			
Iron ore, gross weight, thousand tons	1,569	1,607	1,608
Pig iron (including blast furnace ferroalloys), do	7,009	7,548	7,961
Ferroalloys (electric furnace only), do	97	104	122
Crude steel, do	10,802	11,480	12,064
Steel semimanufactures, do	8,565	9,300	12,000
Lead:			
Mine output, metal content	6,630	5,680	5,101
Metal including secondary	20,145	17,615	18,000
Manganese ore, gross weight	84,000	86,000	[e] 90,000
Mercury, 76-pound flasks	435	4,815	[e] 7,000
Nickel metal, primary [e]	800	800	800
Silver [e], thousand troy ounces	1,100	1,100	1,100
Tin:			
Mine output, metal content, long tons	155	[e] 163	[e] 150

See footnotes at end of table.

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[1] Foreign minerals specialist, Division of Fossil Fuels.

Table 1.—Czechoslovakia: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity [1]	1969	1970	1971 [p]
METALS—Continued			
Tin—Continued			
Metal including secondary ... long tons	69	64	[e] 60
Zinc mine output, metal content	10,460	10,250	8,560
NONMETALS			
Barite [e]	7,000	7,500	8,000
Cement, hydraulic ... thousand tons	6,733	7,401	7,956
Clays, kaolin ... do	343	367	[e] 375
Fertilizer materials manufactured:			
Nitrogenous, nitrogen content ... do	299	324	336
Phosphatic:			
Thomas slag, P_2O_5 content	4,196	3,712	331,000
Other, P_2O_5 content	284,650	318,640	
Fluorspar [e]	60,000	80,000	80,000
Gypsum and anhydrite:			
Crude ... thousand tons	440	487	[e] 500
Calcined [e] ... do	25	25	25
Lime (quicklime and hydrated lime) [2] ... do	2,131	2,148	2,254
Magnesite:			
Crude ... do	[e] 2,200	[e] 3,000	3,500
Clinker [e] ... do	900	1,100	1,200
Perlite [e]	10,000	10,000	10,000
Pyrite:			
Gross weight ... thousand tons	357	342	[e] 340
Sulfur content [e] ... do	150	144	143
Salt ... do	209	213	[e] 220
Stone, limestone and other calcareous ... do	17,034	18,184	19,422
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen	810,793	858,162	1,007,102
Coal:			
Bituminous ... thousand tons	27,068	28,053	28,700
Brown ... do	75,262	78,007	80,200
Lignite ... do	4,075	3,776	4,100
Total ... do	106,405	109,836	113,000
Coke:			
From bituminous coal:			
Metallurgical ... do	7,905	8,269	8,613
Gashouse ... do	29	25	12
Unspecified [3] ... do	2,108	1,968	1,837
Total ... do	10,042	10,262	10,462
From brown coal ... do	1,548	1,408	[e] 1,400
Fuel briquets (from brown coal) ... do	1,308	1,356	1,366
Gas:			
Manufactured, all types ... million cubic feet	240,174	250,486	NA
Natural, marketed ... do	33,000	[e] 32,000	[e] 30,000
Petroleum:			
Crude:			
As reported ... thousand tons	210	203	193
Converted [e] ... thousand 42-gallon barrels	1,424	1,377	1,309
Refinery products: [4]			
Kerosine ... do	1,728	1,792	NA
Diesel oil ... do	20,239	21,910	NA
Lubricants ... do	791	938	NA

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, Czechoslovakia also produces arsenic, gold, feldspar, graphite, uranium, a number of additional crude construction materials such as stone, sand and gravel, and other petroleum products such as gasoline and residual fuel oil, but information is inadequate to make reliable estimates of output levels.

[2] Excludes output by small producers.

[3] Derived by subtracting reported metallurgical and gashouse coke from reported total coke output.

[4] Data are presented only for those products reported in official sources; insofar as can be determined, Czechoslovakia produces a complete range of petroleum refinery products.

TRADE

While no details of Czechoslovakia's 1971 mineral trade were available at the time of this writing, Czechoslovak sources claimed that exports totaled $4,357 million. Fuels, raw materials, and metals constituted about 17.8 percent of total exports or $776 million, about a 4.3-percent increase over the 1970 exports of those commodities. Exports of chemical products and fertilizers contributed 4.6 percent of total exports or $201 million, increasing by 8.8 percent over the previous year's exports in those commodities.

Total imports were valued at $4,010 mil-

Table 2.—Czechoslovakia: Exports of selected mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum:			
Oxide and hydroxide	4,506	4,975	All to Austria.
Metal and alloys:			
Scrap	1,134	702	West Germany 373; Austria 329.
Unwrought and semimanufactures	12,319	5,816	Austria 1,566; France 1,529; West Germany 1,219.
Chromium oxide and hydroxide	230	--	
Copper:			
Ore and concentrate	5,865	923	West Germany 723; United States 200.
Metal and alloys:			
Scrap	954	996	West Germany 684; Austria 312.
Unwrought and semimanufactures	r 3,926	5,333	West Germany 2,642; Poland 2,416; Italy 275.
Iron and steel:			
Ore and concentrate	r 18,602	41,395	All to Austria.
Roasted pyrite	6,491	5,901	Do.
Scrap thousand tons	41	47	Italy 36; Austria 7.
Pig iron do	69	43	Yugoslavia 23; Japan 10; Sweden 6.
Ferroalloys do	32	29	West Germany 13; Austria 5; Italy 4.
Steel ingots and other primary forms do	289	234	West Germany 83; Italy 73; Yugoslavia 32.
Semimanufactures: [2]			
Bars, rods, angles, etc do	1,093	1,215	Poland 163; East Germany 147; Yugoslavia 103.
Plates and sheets do	460	523	Italy 95; France 77; West Germany 66.
Hoop and strip do	169	191	Yugoslavia 56; Arab Republic of Egypt 28; Lebanon 22.
Railway material do	10	16	West Germany 9; Poland 4.
Wire do	51	49	West Germany 13; Hungary 8; Poland 4.
Pipes and tubes do	377	387	People's Republic of China 15; East Germany 14; West Germany 13; Finland 12.
Castings do	1	2	Mainly to West Germany.
Total do	r 2,161	2,383	
Lead:			
Ore and concentrate	2,501	--	
Metal and alloys:			
Scrap	150	160	All to Denmark.
Unwrought and semimanufactures	1,356	--	
Magnesium metal and alloys:			
Scrap	618	808	Austria 437; West Germany 371.
Unwrought and semimanufactures	151	1,136	All to West Germany.
Nickel:			
Matte and speiss	10	35	All to Sweden.
Metal and alloys:			
Scrap	992	1,153	West Germany 875; Netherlands 237; Belgium-Luxembourg 41.
Unwrought	1,602	834	Japan 448; Netherlands 203; Sweden 83.
Platinum-group metals unworked and partly worked value, thousands	$740	--	
Tin metal and alloys, unwrought and semimanufactures long tons	15	14	All to Belgium-Luxembourg.
Titanium oxides	1,484	1,533	Sweden 651; Italy 427; France 235.
Tungsten:			
Ore and concentrate	386	345	West Germany 214; United Kingdom 131.
Metal, all forms	20	--	
Zinc:			
Ore and concentrate [3]	23,415	21,014	Poland 11,446; West Germany 9,568.
Metal, scrap only	280	223	All to West Germany.
Metals, nonferrous n.e.s.:			
Ore and concentrate	7,938	17,325	All to Austria.
Waste and sweepings of platinum-group metals value, thousands	$644	$370	All to United Kingdom.
Ash and other nonferrous base metal bearing residues	9,733	10,451	West Germany 5,982; Austria 2,140; Belgium-Luxembourg 1,269.
Metal unwrought and semimanufactures	942	533	West Germany 489.
NONMETALS			
Barite	--	6,226	West Germany 4,842; Austria 1,384.
Cement, hydraulic thousand tons	209	241	Yugoslavia 201; West Germany 40.

See footnotes at end of table.

Table 2.—Czechoslovakia: Exports of selected mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
NONMETALS—Continued			
Clays and products:			
Crude: [4]			
Bleaching clay [5] thousand tons	3	6	All to Poland.
Kaolin [2] do	57	56	Poland 47; East Germany 9.
Type not specified [6] do	340	388	West Germany 179; Yugoslavia 45; Italy 42; Austria 36.
Products:			
Nonrefractory do	25	24	Yugoslavia 6; West Germany 5; Austria 5.
Refractory do	24	25	Sweden 11; West Germany 5; France 2.
Diamond, gem and industrial value, thousands	$298	$122	All to Belgium-Luxembourg.
Fertilizer materials:			
Crude phosphatic [7]	4,000	--	
Manufactured nitrogenous [3]	20,878	--	
Ammonia [3]	2,627	1,006	All to West Germany.
Gem stones, precious and semiprecious, except diamond value, thousands	$130	$141	Canada $69; United Kingdom $33.
Graphite do	$40	--	
Magnesite [2] thousand tons	352	335	West Germany 139; Poland 77; Hungary 54.
Mica worked	37	68	Italy 32; Yugoslavia 24; West Germany 12.
Stone, sand and gravel:			
Dimension stone, crude and worked	[r] 34,283	36,358	West Germany 32,999; Netherlands 3,339.
Gravel and crushed rock	142,649	60,004	All to West Germany.
Sand	9,928	12,420	All to Austria.
Talc [5]	4,024	2,955	Poland 2,634; Yugoslavia 321.
MINERAL FUELS AND RELATED MATERIALS			
Coal:			
Bituminous [2] thousand tons	2,654	2,970	East Germany 1,064; Hungary 580; Austria 483.
Lignite [2] do	1,248	1,250	West Germany 1,202; Austria 39.
Coke and semicoke [2] do	2,586	2,500	East Germany 796; Romania 613; Hungary 308.
Gas, natural and manufactured (including LPG) do	86	33	Austria 23; West Germany 9.
Petroleum:			
Partly refined oil thousand 42-gallon barrels	3,147	2,201	All to Austria.
Refinery products:			
Gasoline do	806	373	Do.
Distillate fuel oil do	2,672	1,647	Switzerland 1,519; West Germany 128.
Residual fuel oil do	2,116	358	All to Austria.
Lubricants do	27	22	Austria 14; Yugoslavia 5.
Other do	613	761	Netherlands 298; Austria 220; West Germany 170.
Crude chemicals from coal, gas or oil distillation [3]	61,031	69,224	West Germany 39,456; Italy 17,417; Yugoslavia 5,216.

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[r] Revised.

[1] Because Czechoslovakia publishes only limited data on mineral commodity exports, this table has been compiled from a variety of sources. Except where otherwise noted, information is from the 1969 and 1970 editions of the Supplement to the World Trade Annual. V. 1 (East Europe), prepared by the Statistical Office of the United Nations and published by Walker and Company, New York.

[2] Statisticka Rocenka Ceskoslovenske Socialistické Republiky, 1970 (Statistical Annual of the Czechoslovak Socialist Republic, 1971), Prague, 618 pp.; and Statistics of World Trade in Steel, United Nations New York, 1969 and 1970 editions.

[3] Supplement to the World Trade Annual (see footnote 1) and official Polish trade returns (see footnote 5).

[4] Official Czechoslovakian sources report the export of kaolin alone as follows: 1969–249,000 tons; 1970–192,000 tons. These figures are not included in the body of the table because they duplicate in part data presented under the caption "Type not specified" which are from the Supplement to the World Trade Annual, but the latter figures do not include shipments to Poland and East Germany which have been listed separately under kaolin.

[5] Glówny Urzad Statystyczny (Central Statistical Council). Rocznik Statystyczny Handlu Zagranicznego 1971 (Foreign Trade Annual for 1971) Warsaw, 1971, 438 pp.

[6] Includes kaolin (see also footnote 3).

[7] Hungarian Central Statistical Office. Statistical Yearbook, 1969, 1970. Budapest, 1970, 395 pp. and 1971, 573 pp.

Table 3.—Czechoslovakia: Imports of selected mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum:			
Bauxite and concentrate [2] thousand tons	429	378	Hungary 273; Yugoslavia 87.
Oxide and hydroxide [2] do	9,000	10,118	Mainly from Hungary.
Metal and alloys:			
Scrap	800	860	Austria 734; West Germany 126.
Unwrought [2 3]	60,231	73,413	U.S.S.R. 70,600; Hungary 2,813.
Semimanufactures [3]	21,662	26,468	Mainly from U.S.S.R.
Chromium, chromite ore and concentrate [3 4] thousand tons	134	99	U.S.S.R. 89; Yugoslavia 10.
Copper:			
Metal and alloys:			
Unwrought [3]	42,017	39,472	U.S.S.R. 35,800; Belgium-Luxembourg 1,800.
Semimanufactures [3]	r 9,496	5,700	West Germany 2,643; Yugoslavia 1,447; Poland 866.
Iron and steel:			
Ore and concentrate [5] thousand tons	10,716	12,724	U.S.S.R. 10,838; India 708; Sweden 481.
Scrap [4 6] do	1	19	Mainly from Greece.
Pig iron [4 6] do	706	790	U.S.S.R. 784; Australia 5.
Ferroalloys [4 6] do	88	104	Mainly from U.S.S.R.
Steel, primary forms [7] do	3	14	Hungary 8; Poland 6.
Semimanufactures: [7]			
Bars, rods, sections do	103	89	U.S.S.R. 72; Hungary 8; Poland 5.
Plates and sheets do	452	432	U.S.S.R. 283; West Germany 100; Norway 18.
Hoop and strip do	16	15	West Germany 8; Austria 5.
Railway material do	12	11	All from U.S.S.R.
Wire do	5	6	West Germany 3; Austria 1.
Pipes, tubes, and fittings do	16	27	U.S.S.R. 11; West Germany 6; Yugoslavia 6.
Castings and forgings do	1	1	Mainly from Italy.
Total do	r 605	581	
Lead:			
Oxides	3,759	3,027	France 1,316; Austria 1,291; Netherlands 420.
Metal and alloys, all forms [3]	25,538	26,508	U.S.S.R. 24,900; Yugoslavia 994.
Magnesium metal and alloys, all forms [3]	1,600	1,702	All from U.S.S.R.
Manganese ore and concentrate [5] thousand tons	387	202	U.S.S.R. 134; India 35.
Mercury 76-pound flasks	3,510	1,479	Yugoslavia 899; Spain 580.
Molybdenum metal and alloys, all forms	2	1	All from Austria.
Nickel metal and alloys, all forms	16	64	West Germany 39; United Kingdom 25.
Platinum-group metals and alloys unwrought and semimanufactures value, thousands	$209	$208	West Germany $164; Yugoslavia $40.
Silver and alloys, unwrought and semimanufactures do	$1,545	$2,133	Netherlands $1,151; United Kingdom $920.
Tin:			
Oxides long tons	--	39	NA.
Metal and alloys, all forms do	1,226	823	United Kingdom 709; Netherlands 108.
Titanium oxides	993	1,093	West Germany 903; Italy 190.
Tungsten:			
Ore and concentrate	--	955	United States 833; Portugal 102.
Metal and alloys, all forms	1	2	Austria 1; France 1.
Zinc:			
Dust (blue powder)	855	2,936	Belgium-Luxembourg 2,318; Italy 618.
Metal and alloys, all forms [3 4 6]	r 36,670	41,435	U.S.S.R. 26,000; Poland 9,136; Yugoslavia 4,652.
Other:			
Ore and concentrate	11,313	25,716	Finland 24,667; United States 390.
Metal and alloys n.e.s	91	111	Belgium-Luxembourg 69; United States 42.
NONMETALS			
Abrasives, natural, grinding stones	172	276	West Germany 92; Italy 91; Austria 89.
Asbestos	29,229	39,017	U.S.S.R. 20,375; Canada 2,560.
Barite	1,059	935	All from West Germany.
Borates, crude, natural	11,100	--	
Cement [2 3 4 6] thousand tons	391	474	U.S.S.R. 457; Hungary 11; Poland 5.
Clays and products:			
Crude	13,275	12,786	Yugoslavia 11,276; West Germany 1,377.
Products:			
Nonrefractory	247	3,780	Yugoslavia 3,471; Italy 309.
Refractory	2,542	4,089	Austria 1,395; France 1,358; Italy 217.

See footnotes at end of table.

Table 3.—Czechoslovakia: Imports of selected mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
NONMETALS—Continued			
Diamond:			
Gem value, thousands	$49	$158	Belgium-Luxembourg $101; United Kingdom $57.
Industrial do	$1,741	$1,017	All from Belgium-Luxembourg.
Feldspar and fluorspar	6,310	15,449	France 6,344; Yugoslavia 5,750; West Germany 3,355.
Fertilizer materials:			
Crude, phosphatic [5] thousand tons	498	473	All from U.S.S.R.
Manufactured:			
Nitrogenous, N content [5] do	86	97	U.S.S.R. 80; Austria 13.
Phosphatic, P_2O_5 content [5] do	328	361	U.S.S.R. 199; Lebanon 12.
Potassic K_2O equivalent [5] do	459	526	East Germany 457.
Gem stones, precious and semiprecious, except diamond value, thousands	$29	$45	All from Netherlands.
Graphite, natural [3] [4]	638	664	U.S.S.R. 421; West Germany 243.
Gypsum [6]	3,441	3,903	All from Poland.
Lime [6]	104,519	110,266	Do.
Magnesite	3,515	--	
Mica worked	11	12	All from Switzerland.
Pigments, mineral, iron oxides	2,076	1,738	All from West Germany.
Pyrite, sulfur content of [5] thousand tons	33	76	U.S.S.R. 40; Yugoslavia 2.
Salt: [5]			
Rock	40,399	34,839	All from Poland.
Brine	[r] 114,703	121,558	U.S.S.R. 110,100; Poland 11,458.
Sodium and potassium compounds n.e.s.:			
Caustic soda	18,907	16,450	Poland 9,678; West Germany 6,350.
Soda ash	48,124	45,670	U.S.S.R. 22,700; Poland 18,015; France 2,040.
Stone, sand and gravel:			
Quartz and quartzite	1,500	2,450	All from West Germany.
Crushed stone and gravel	2,568	3,291	Austria 1,330; Denmark 998; France 963.
Dimension stone worked	535	1,117	All from Yugoslavia.
Sand	1,965	--	
Sulfur:			
Elemental, all forms thousand tons	267	303	U.S.S.R. 169; Poland 134.
Sulfuric acid [3] [4] [6] do	47	90	U.S.S.R. 77; Poland 10; Yugoslavia 2.
Other, unspecified, crude nonmetals	[r] 430	162	All from Austria.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black [3] [4]	13,675	16,467	U.S.S.R. 10,827; France 2,534; Italy 2,044.
Coal, anthracite and bituminous [5] thousand tons	4,624	4,569	U.S.S.R. 2,688; Poland 1,840.
Coke and semicoke [3] do	81	NA	NA.
Gas, natural [5] million cubic feet	31,380	47,371	All from U.S.S.R.
Petroleum:			
Crude [3] thousand 42-gallon barrels	68,906	72,015	U.S.S.R. 69,105.
Refinery products:			
Gasoline do	97	66	All from Yugoslavia.
Kerosine and jet fuel do	59	14	Yugoslavia 8; West Germany 6.
Lubricants do	337	294	Austria 279; West Germany 7.
Other do	10	--	
Undifferentiated [3] thousand tons	[r] 10,028	10,466	All from U.S.S.R.
Crude chemicals from coal, gas or oil distillations	163	--	

[r] Revised. NA Not available.

[1] Because of limited Czechoslovakian trade data on imports of mineral commodities, this table has been compiled from export data of trading countries with Czechoslovakia. All entries without a source footnote are from Statistical Office of the United Nations, 1969 and 1970 editions of the Supplement to the World Trade Annual. V. 1 (East Europe), Walker and Company, New York.

[2] Official trade returns of Hungary.

[3] Official trade returns of the U.S.S.R.

[4] Statistical Office of the United Nations, 1969 and 1970 editions of the Supplement to the World Trade Annual. V. 1 (East Europe), Walker and Company, New York.

[5] Statisticka Rocenka Ceskoslovenske Socialistké Republiky, 1970 (Statistical Annual of the Czechoslovak Socialist Republic, 1971), Prague, 1971, 618 pp.

[6] Official trade returns of Poland.

[7] Statistics of World Trade in Steel, United Nations, New York, 1969 and 1970 editions.

lion. Fuels, raw materials, and metals constituted about 25.5 percent of total imports for 1971 or $1,023 million, an increase of 16.7 percent over the previous year. Chemical products and fertilizers constituted about 9.1 percent of total imports or $368 million, an increase of 10.8 percent over 1970.

The following mineral commodity trade tables for 1969 and 1970 were compiled chiefly from trade returns of other nations, listing each country's imports from Czechoslovakia as exports of Czechoslovakia, and each country's exports to Czechoslovakia as imports of Czechoslovakia. This policy has been adopted because of the incomplete nature of official Czechoslovak returns. It is believed that this method results in a reasonable approximation of Czechoslovakia's total mineral trade.

Compiled on the basis of reverse trade data, Czechoslovakia's mineral commodity exports to non-Communist nations including Yugoslavia were valued at an estimated $268 million in 1970, about 18 percent above the previous year's level, while the country's 1970 mineral commodity imports from these countries were valued at about $135 million compared with approximately $98 million in 1969.

Mineral exports to the U.S.S.R. were reported at $113 million[2] and imports at $485 million in 1970.

COMMODITY REVIEW

METALS

Aluminum.—Czechoslovak statistics indicate that Ziar Nad Hronom, the nation's sole primary aluminum plant, is operating at approximately one-half capacity. Production based on imported bauxite was estimated at 37,000 tons of primary metal in 1971 satisfying about one-third of the Czechoslovak requirements for aluminum.

Iron and Steel.—Investments in the iron and steel industry have been focused upon the replacement of obsolete furnace units resulting in a steady growth pattern in pig iron and crude steel production. At midyear a 1,095-cubic-meter-volume blast furnace of 500,000-ton-per-year capacity was blown in at the Klement Gottwald Iron & Steel Works replacing two smaller furnaces. By the end of the current 5-year plan (1975) Czechoslovak pig iron production, based almost entirely on imported ores, is planned at 8.8 million tons. Increased output of crude steel is mainly attributable to a full-year operation of new furnace units at the Klement Gottwald Iron & Steel Works.

Within the framework of the current 5-year plan Czechoslovak crude steel output should reach 14 million tons by 1975. For the most part, production increases will be effected by replacement of obsolete furnaces with oxygen converters. Oxygen steel accounted for 18 percent of the total steel output in 1970. By 1975, 27 percent of the total steel output or 3.78 million tons of steel will be produced in oxygen converters. Steel production by furnace type is listed in table 4.

NONMETALS

Clays.—*Kaolin.*—The industry has maintained a steady growth pattern and has consistently exported about one-half of its annual kaolin production. Construction of the Bozicany kaolin processing plant was near completion by yearend. Initial plant capacity is anticipated at 10,000 tons in 1972, expanding to 80,000 tons by 1974.

Fertilizer and Fertilizer Materials.—Fertilizer production based on imported raw materials principally from the U.S.S.R. and East Germany satisfied most of the nation's nitrogenous fertilizer requirements and about half of its phosphatic fertilizer requirements. Expansion programs outline a fertilizer production capacity of 878,000 tons in nitrogen content, 454,000 tons in phosphorus pentoxide content, and 337,000 tons in potassium oxide equivalent by 1980. Emphasis will be placed on triple superphosphates and complex fertilizers representing about 48 percent of total output in terms of nutrient content.

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[2] Values have been converted from U.S.S.R. rubles to U.S. dollars at the rate of 1 ruble= US$1.11; however, values are probably derived by negotiated agreement between the U.S.S.R. and Czechoslovakia, resulting in the above figures being more representative of a general range rather than actual world market price value for mineral commodities.

Table 4.—Salient statistics on iron and steel production

	1968	1969	1970
PIG IRON			
Number of blast furnaces	19	19	17
Production of pig iron and ferroalloys:			
Pig iron for steelmaking thousand metric tons	6,423	6,537	7,128
Pig iron for foundry do	446	451	393
Blast furnace ferroalloys do	49	21	27
Electric furnace ferroalloys do	100	97	104
Total do	7,018	7,106	7,652
Materials consumed per ton of pig iron:			
Iron ore and manganese ore kilograms	361	385	336
Sinter do	1,571	1,538	1,653
Scrap do	40	36	31
Coke do	637	638	613
Limestone do	172	164	150
INGOT STEEL			
Production of crude steel:			
Open hearth thousand metric tons	7,493	7,536	7,841
Bessemer do	246	225	231
Electric furnace do	1,272	1,270	1,344
Oxygen converter do	1,544	1,771	2,064
Total do	10,555	10,802	11,480
Materials consumed per ton of crude steel:			
Pig iron kilograms	632	701	718
Scrap do	462	392	421

MINERAL FUELS

Czechoslovakia's primary energy consumption in 1971 was estimated at 88 million tons measured in standard fuel equivalent (SFE). Domestic fuels, principally bituminous, brown, and lignite coals supplied an estimated 73 percent of the nation's energy requirements. The remainder was supplied through imported crude and petroleum products, anthracite and bituminous coals, coke, and natural gas. By 1975 projected fuel requirements were estimated at 103 million tons of SFE. About half of the projected requirements will be covered by expanded fuel imports.

Coal.—Production from collieries and pits totaled a record 113 million tons in 1971, representing a 3-percent increase in output since the introduction of the 1965 industrial reforms emphasizing increased mechanization and the abandonment of marginal operations. About 90 percent of Czechoslovakia's total output is derived from the Ostrava Karvina field, the North Bohemian fields, and the Sokolov field. Table 5 shows actual productivity from these fields in 1965 and planned productivity for 1970 and 1975; however, output from these fields exceeded the 1970 plan indicating that the planned productivity figures may be conservative.

Major development activity has been undertaken at the Maxim Gorky sub-bituminous deposit in North Bohemia. By 1972 an estimated 7,000 million cubic feet of overburden will be removed to expose a 380-million-ton deposit averaging 3,381 kilocalories per kilogram. During the 1971–75 5-year plan the mine output should reach an annual capacity of 20 million tons.

Table 5.—Czechoslovakia: Labor productivity in principal coalfields

Coalfield	Production (thousand tons)			Number of mine workers [1]			Productivity (tons per worker per year)		
	1965	Plan		1965	Plan		1965	Plan	
		1970	1975		1970	1975		1970	1975
Ostrava Karvina	[2] 22,293	[2] 22,932	[2] 22,946	80,460	60,986	53,232	277	376	431
North Bohemia	37,674	44,347	51,300	19,796	19,172	20,356	1,923	2,313	2,520
Sokolov	17,200	18,164	16,950	7,065	7,289	6,836	2,435	2,492	2,480

[1] Includes pit men, open cast miners, maintenance men, administrative personnel, security, and general services.

[2] Production indicator for calculating productivity at Ostrava Karvina is the net output indicator while in other fields the indicator of salable output for the whole coalfield is applied.

Gas.—*Manufactured and Natural.*—Czechoslovakia produced about 250 billion cubic feet of manufactured gas equivalent to 131,250 billion British thermal units (Btu). About 60 percent of the manufactured gas output is consumed by industry and most of the remainder is consumed in domestic heating. Production of natural gas in 1971 was estimated at 30 billion cubic feet (29,700 billion Btu). Natural gas imports from the Soviet Union delivered via the Bratstvo pipeline were estimated at 55 billion cubic feet (49,500 billion Btu). Added pipeline facilities will enable Czechoslovakia to transport Soviet natural gas at a rate of 280 billion cubic feet annually by 1980.

Construction was undertaken late in January on a pipeline of 990-billion-cubic-foot-per-year capacity connecting natural gasfields of the U.S.S.R. with consuming centers in Czechoslovakia, Austria, Italy, East Germany, and West Germany. The pipeline crosses Czechoslovakia about 1,000 kilometers. Midyear reports indicated that construction was behind schedule principally because of delays in equipment shipments, labor shortages, and the adoption of time-consuming manual welding techniques. Apparently the difficulties were overcome by yearend as the completion dates were reconfirmed as January 1973 for the line to Austria and Italy; April 1973 for the line to East Germany; and October 1973 for the line to West Germany.

Petroleum.—Domestic production derived principally from fields in South Central Czechoslovakia averaged about 35,863 barrels per day supplying about 17 percent of the nation's refinery feedstock in 1971. The bulk of Czechoslovakia's crude requirements are imported from the Soviet Union. The Druzba (Friendship) pipeline transported an estimated 215,000 barrels per day of crude to the Slovnaft and Zaluzi refineries in 1971. While the Soviet Union will apparently continue to be Czechoslovakia's principal source of crude oil, at least 150 million barrels of crude will be imported from Iran during the next 10 to 15 years. An agreement was under negotiation with Nigeria whereby Czechoslovakia will accept crude oil in payment for technical assistance rendered to develop the Nigerian petrochemical industry.

The Mineral Industry of the Arab Republic of Egypt

By Roman V. Sondermayer[1]

During 1971 the mineral industry of Egypt was of modest significance to the country's economy. The petroleum sector remained the most important segment of the industry. Output of nonmetallics ranked second in mineral value. The focal points of Egypt's mineral industry were planning for the construction of an aluminum plant at Haj Hammadi and a ferrosilicon plant at Idfu, the construction of the Helwan iron and steel complex, the development of phosphate deposits near Abu Tartur, and exploration for hydrocarbons in the Western Desert. In addition, exploration for other metals and nonmetallics continued throughout the year. Most of the exploration was conducted by experts from the U.S.S.R. However, no significant discoveries were announced during the year.

PRODUCTION

During 1971 there was no general overall trend in production of minerals in Egypt. Certain commodities increased in production whereas others declined. Productivity remained modest. Technology from the U.S.S.R. was dominant in the country. Most large projects recently constructed in Egypt were built with the assistance of the U.S.S.R. or other countries with a Communist regime. Table 1 shows production statistics for mineral production in recent years.

Table 1.—Arab Republic of Egypt: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971 [p]
METALS			
Iron and steel:			
Iron ore and concentrate thousand tons	460	451	[e] 500
Pig iron do	423	[e] 450	[e] 450
Crude steel [e] do	490	500	500
Manganese ore and concentrate do	4	4	[e] 4
Titanium, ilmenite concentrate, gross weight	204	--	--
NONMETALS			
Asbestos (including vermiculite)	--	449	[e] 450
Barite	(1)	215	--
Cement, hydraulic thousand tons	3,613	3,686	[e] 3,800
Clays:			
Fire do	928	975	[e] 1,000
Kaolin	78,000	22,441	[e] 30,000
Diatomite	900	2,326	[e] 2,500
Feldspar, crude	3,000	1,737	[e] 2,000
Fertilizer materials:			
Crude phosphate rock thousand tons	660	716	[e] 750
Manufactured:			
Nitrogenous do	[r] 418	387	[e] 400
Phosphatic:			
Thomas slag do	344	411	[e] 420
Superphosphate do	39	22	[e] 20
Gypsum and anhydrite, crude do	470	[e] 500	[e] 500
Pumice	200	200	[e] 200
Salt, marine thousand tons	385	444	[e] 500

See footnotes at end of table.

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[1] Petroleum engineer, Division of Fossil Fuels.

Table 1.—Arab Republic of Egypt: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971 [p]
NONMETALS—Continued			
Stone, sand and gravel, n.e.s:			
Basalt thousand cubic meters	3,420	NA	NA
Dolomite thousand tons	[e] 70	85	NA
Granite thousand cubic meters	[e] 30	14	NA
Gravel do	1,500	1,600	NA
Limestone and other calcareous, n.e.s do	4,300	5,650	NA
Quartz	13,000	NA	NA
Sand, including glass sand thousand cubic meters	2,825	NA	NA
Sandstone do	75	NA	NA
Sulfur, elemental, byproduct	500	[e] 650	[e] 650
Talc, soapstone, steatite and pyrophyllite	4,300	6,487	[e] 6,500
MINERAL FUELS AND RELATED MATERIALS			
Coal thousand tons	4	--	--
Coke:			
Oven and beehive do	312	[e] 320	[e] 320
Gashouse and other low temperature do	35	[e] 30	[e] 30
Total do	347	[e] 350	[e] 350
Gas:			
Manufactured, all types do	[e] 30	[e] 30	[e] 30
Natural million cubic feet	2,507	[e] 3,000	[e] 3,000
Petroleum:			
Crude thousand 42-gallon barrels	89,598	119,165	101,898
Refinery products:			
Gasoline do	3,868	4,207	NA
Jet fuel do	24	3,997	NA
Kerosine do	3,294		
Distillate fuel oil do	3,633	4,122	NA
Residual fuel oil do	9,850	10,814	NA
Other do	404	563	NA
Refinery fuel and losses do	1,264	[e] 1,422	NA
Total do	22,337	[e] 25,125	NA

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.
[1] Revised to zero.

Table 2.—Arab Republic of Egypt: Exports[1] of major mineral commodities[2]

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum, including alloys, semimanufactures	1	387
Copper including alloys, semimanufactures	87	100
Iron and steel:		
Roasted pyrite	992	--
Pig iron, sponge, iron and steel powder	4,545	4,391
Primary forms	41,919	7,737
Semimanufactures	16,163	40,830
Lead, including alloys, semimanufactures	27	--
Other:		
Nonferrous ores and concentrates, n.e.s	1	--
Ash and residues bearing nonferrous metals, n.e.s	246	80
NONMETALS		
Abrasives, natural, grinding stones	15	--
Asbestos, crude	--	9
Cement	819,791	346,128
Chalk	--	100
Clays and products:		
Clays, crude n.e.s	543	--
Products:		
Refractory (including nonclay bricks)	1	29
Nonrefractory	4,004	952
Diamond:		
Gem carats	503	--
Industrial do	19,178	10,662
Diatomite	25	--
Fertilizer materials:		
Crude, phosphatic	409,523	319,299
Manufactured:		
Nitrogenous	--	1,150
Phosphatic, Thomas slag	39,102	93,016
Gypsum and plasters	45	3
Lime	1,945	778
Salt	41,080	60,532
Stone, sand and gravel:		
Dimension stone, crude and worked	763	22
Quartz and quartzite	--	3,600
Gravel and crushed rock	401	--

See footnotes at end of table.

Table 2.—Republic of Egypt: Exports[1] of major mineral commodities[2]—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970
NONMETALS—Continued		
Sulfur, sulfuric acid	50	46
Talc, steatite	2,530	412
Other nonmetals, n.e.s.:		
Crude:		
Meerschaum, amber and jet	1	--
Other	4	2
Slag and ash, n.e.s	43	--
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	328	--
Coke and semicoke	19,843	--
Peat, including briquets and litter	50	--
Gas, hydrocarbon:		
Natural	190	130
Petroleum:		
Crude, thousand 42-gallon barrels	10,912	24,826
Partly refined, do	--	31
Refinery products:		
Kerosine and jet fuel, do	r280	177
Distillate fuel oil, do	r782	186
Other:		
Nonlubricating oils, n.e.s, do	1,078	29
Liquefied petroleum gas, do	--	2
Petroleum coke, do	136	7
Total, do	r2,276	401

r Revised.

[1] Includes re-exports.

[2] From the Central Agency for Public Mobilization and Statistics. July 1970 and October 1971.

Table 3.—Arab Republic of Egypt: Imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum:		
Oxide and hydroxide	267	96
Metal:		
Scrap	4,578	4,893
Unwrought and semimanufactures	1,262	1,114
Arsenic, trioxide, pentoxide, and acid	105	22
Chromium oxides, and hydroxides	5	26
Cobalt oxides, and hydroxides	42	2
Copper:		
Matte	1,309	1,484
Metal including alloys, all forms	393	664
Gold, troy ounces	685	1,170
Iron and steel:		
Roasted pyrite	59,883	4,582
Metal:		
Scrap	32,310	9,664
Sponge iron, powder and shot	155	87
Spiegeleisen	52,776	42,208
Ferromanganese	6,279	3,485
Steel, primary forms	8,713	11,148
Semimanufactures	136,028	204,158
Lead:		
Oxides	549	707
Metal including alloys, all forms	8,134	4,897
Magnesium metal unwrought and semimanufactures	NA	860
Manganese: Oxides	1,346	965
Mercury, 76-pound flask	58	123
Molybdenum metal including alloys, all forms	3	4
Nickel:		
Matte, speiss, and similar materials	19	2
Metal including alloys, semimanufactures	9	38
Platinum group and silver:		
Waste and sweeping, troy ounces	482	--
Metals, including alloys:		
Platinum, do	64	(2)
Silver, unwrought and semimanufactures, thousand troy ounces	93	48
Rare-earth compounds including thorium and uranium compounds	4	--
Tin:		
Oxide, long tons	6	10
Metal including alloys, all forms, do	289	621
Titanium oxides	584	591
Tungsten	1	1
Uranium and thorium and their alloys	95	24

See footnotes at end of table.

Table 3.—Arab Republic of Egypt: Imports of mineral commodities[1]—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970
NONMETALS—Continued		
Zinc:		
Oxides	292	384
Metal including alloys, all forms	2,740	3,527
Other:		
Ore and concentrate, n.e.s	7,367	2,304
Metal, including alloys, all forms:		
Pyrophoric alloys (including ferrocerium)	1	(2)
Base metals, including alloys, all forms, n.e.s	41	2
NONMETALS		
Abrasives, natural, n.e.s	45	146
Asbestos	2,717	6,609
Boron materials, oxide and acid	23	3
Cement	2,889	717
Chalk	5	1
Clays and products (including all refractory brick):		
Crude clays, n.e.s	5,178	9,443
Products:		
Refractory (including nonclay bricks)	11,806	11,541
Nonrefractory	6	11
Diamond not set or strung carats	90	--
Diatomite	3,466	1,786
Feldspar and fluorspar	417	34
Fertilizer materials:		
Crude:		
Nitrogenous	30	22
Phosphatic	--	1
Potassic	7,385	(2)
Manufactured:		
Nitrogenous	287,176	198,769
Other including mixed	20	1
Ammonia	28	68
Graphite, natural	157	107
Gypsum and plasters	335	(2)
Lime	NA	42
Magnesite	916	3,422
Mica, including worked	56	36
Pigments, mineral, natural, crude	769	841
Pyrite, unroasted	26,978	47,514
Salt	15	28
Sodium and potassium compounds, n.e.s.:		
Caustic soda	47,253	20,056
Caustic potash, peroxides of potassium or sodium	192	302
Stone, sand and gravel:		
Dimension stone, crude and worked	57	43
Dolomite	38	48
Gravel and crushed rock	53	--
Quartz and quartzite	211	41
Sand (excluding metal bearing)	452	350
Sulfur:		
Elemental	41,219	55,343
Sulfur dioxide	39,424	435
Sulfuric acid	10,239	6,351
Talc, steatite, natural	26	11
Other nonmetals, n.e.s.:		
Crude, n.e.s	406	68
Oxides, hydroxides and peroxides of barium and strontium	2	30
Bromine, fluorine and iodine	5	4
Metallurgical residues, not containing metals	NA	29,435
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	5,375	44,505
Coal and briquets:		
Anthracite and bituminous coal	491,660	466,052
Briquets of anthracite and bituminous coal	--	(2)
Lignite and lignite briquets	8	--
Coke and semicoke	72,378	33,905
Gas, natural	68,051	93,087
Hydrogen and rare gases	37	16
Peat including peat briquets and litter	1,811	1,248
Petroleum:		
Crude thousand 42-gallon barrels	6,868	8,075
Partly refined do	14	
Refinery products:		
Gasoline 42-gallon barrels	17	32
Kerosine and jet fuel thousand 42-gallon barrels	2,169	3,255
Distillate fuel oil do	2,963	5,044
Residual fuel oil do	4,933	6,264
Lubricants do	351	736
Other do	1,096	1,388
Total do	11,529	16,719
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	932	74

NA Not available.

[1] From the Central Agency for Public Mobilization and Statistics. July 1970 and October 1971.

[2] Less than ½ unit.

TRADE

During 1970, the latest year for which complete data were available, Egypt's foreign trade remained at the same level as in the past. Petroleum and products remained the principal trading items. Imports of coal and metals continued. In addition to petroleum, nonmetallics represented the bulk of the country's mineral exports. Communist countries remained the largest trading partners.

Tables 2 and 3 give details on foreign trade of Egypt.

COMMODITY REVIEW

METALS

Aluminum.—The U.S.S.R. will supply Egypt with a 100,000-ton-per-year aluminum electrolytic plant at an estimated cost ranging from $90 to $120 million.[2] The new plant will be located in the Haj Hammadi region of Upper Egypt. Construction is to start in 1974. The Aswan Dam hydropower plant will provide the necessary power. No statements were made on the source of alumina for the smelter or on where a yearly surplus of 75,000 tons of aluminum will be marketed.

The project was originally agreed to in July 1969, and the agreement was ratified by legislatures of both countries in 1970. The final step for construction was taken when a protocol was signed in Cairo in the spring of 1971.

Iron and Steel.—Expansion of the Helwan iron and steel complex continued in 1971. Plans are to expand steel output of the Helwan complex of 1.5 million tons of steel per year by 1975. In addition to work on two new blast furnaces, under construction or in trial production were a third coke battery, a new sintering plant, a steel convertor section with continuous casting units, and additions to the rolling mills and ancillary units. The railway connecting the 200-million-ton medium-grade ore deposit at Bahariya Oasis with the complex was near completion in 1971.

A contract was signed in August with the U.S.S.R. to build a ferrosilicon plant at Idfu with a capacity of 28,000 tons of ferrosilicon per year and at a cost equivalent to $2 million. The plant's output will be used to meet the requirements of the iron and steel complex at Helwan.[3]

Titanium.—Egypt has large deposits of black sands which have a low content of TiO_2. The extraction to date has proved uneconomical and the plant of the Egyptian Black Sand Co. has been closed since 1968. The reserves of the black sands in the region were reported at 15 million tons. Recently the Government of Egypt, with assistance from the U.S.S.R., announced plans to resume production and to upgrade the Nile's black sands and deliver beneficiated ilmenite, titanium metal, and Tio_2 pigment. However, realization of the plans depends on the future requirements of the Communist countries, where most of the output will be marketed.[4]

Other Metals.—During 1971 an extensive exploration program for various metals was conducted. Soviet experts participated in most of the activities. Preliminary results indicated the presence of minerals that may be of economic value. Copper and molybdenum were reported at Hamr Akarim and Hemshik; uranium and molybdenum, thorium, columbium, beryllium, lead, and rare metals at El Naka and iron ore and titanium at Wadi Madi.[5]

NONMETALS

Fertilizer Materials.—With the assistance from Communist countries, plans were drawn to expand two phosphate plants and build three new ones. Four of the projects are in Egypt's Eastern Desert, not far from the Red Sea. The fifth, the most important one, is west of the Nile Valley.

The deposit at Abu Tartur is located in the Western Desert of Egypt in rugged country between Dakhla and Kharga Oasis. The Abu Tartur plateau is oval in outline and is bounded by rough topography on all sides except in the northwest, where it merges smoothly into the plateau which forms the central part of the Western Desert. The phosphate overlies colored sandy clays, and ranges in thickness from 20 to 50 meters. There are two layers of ore. The content of calcium phosphate ranges from 51 to 61 percent. The preliminary development project indicates an annual production of 10 million tons of run-of-mine ore. The salable ore will be reduced to 7 million tons of 72 percent of calcium phosphate ~~content.~~ The project calls for a total investment of $200 million, of which about $55 million will be spent on the mine, beneficiation plant, equipment, research, design, and testing. The rest of the investment will be spent on the construction of a 520-kilometer-long railway line from Abu Tartur to Quseir on the Red Sea, the extension of powerlines from Haj Hammadi on the Nile to the industrial site on the plateau; the expansion of the Quseir port on the Red Sea; the drilling for water wells in the Karga-Dakhla area, with a pipeline to bring the water to new industrial facilities in Abu Tartur; and the construction of a housing center for 3,000 workers in the vicinity of the project. The U.S.S.R. is financing geological exploration in the area and specialists from the U.S.S.R. are making feasibility studies on the economic aspects of the Abu Tartur phosphate project. The beginning of operations in Abu Tartur was tentatively planned for 1979.

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[2] Where necessary, values have been converted from Arab Republic of Egypt pounds (E£) to U.S. dollars at the rate of E£1.00=US$2.80.

[3] U.S. Embassy, Cairo, Egypt. State Department Airgram A-17, Sept. 17, 1971, p. 3.

[4] Industrial Minerals. No. 43, April 1971, p. 23.

[5] Federation of Egyptian Industries (Cairo, Egypt). Yearbook for 1970 and 1971. Pp. 5–204.

The Hamrawein phosphate deposits are estimated at 36 million tons of low-grade ores. Four mines and a 600,000-ton-per-year concentration plant were under development and construction at yearend. Specialists from Romania are financing and managing the project.

The third project involves the Safaga (Mohamed Riad) phosphate rock mine on the Red Sea and aims to increase production to 180,000 tons of 62 to 65 percent phosphate. Studies for accurate estimates of the Safaga deposit reserves were underway.

The Nile valley Mahamid Gharib project, which is related to the development of the new phosphorus complex, is part of a group of significant activities in the field of fertilizer resources development. Production is expected to start in 1975–76 at an annual rate of 1.4 million tons. During 1971 activities related to the Mahamid Gharib project were limited to the assessment of reserves and the design of mines and the plant.

Kaolin.—The work on the Kalabash kaolin deposits, 110 kilometers southwest of Aswan, was limited to the evaluation of reserves during 1971. The new deposit is important because all other kaolin deposits in Egypt are located in the occupied territory in Sinai.

Salt.—Production of salt at the Mex facilities was modernized during 1971 and production is expected to reach 0.5 million tons per year by 1972. In addition, new facilities for crushing up to 160,000 tons of salt per year were under construction and new salt storage facilities will be built in 1972.

Other Nonmetals.—Egypt produced a number of nonmetallics during 1971, but the economic significance was modest and limited only to the domestic economy. Exploration and development activities were concentrated on dolomite at Abu Rawash, gypsum at Amidi, marble near Assuit, and silica close to Idfu. Silica tests with ores from deposits near Idfu, which were conducted in the U.S.S.R., proved that the silica was suitable for use in the phosphorus industry.

MINERAL FUELS

The Egyptian position with regard to energy sources used in the country remained the same as in the past. Domestic and imported petroleum refinery products represented the bulk of fuels produced and consumed in Egypt. Egypt had no production of coal; all its coal requirements were covered by imports in 1971.

Natural Gas.—During 1971 Egyptian authorities were examining the possibility of using the natural gas from three gasfields, Abu Qir, Abu Madi, and the recently discovered Abu Gharadig, which are presently out of production.

Western Desert Operating Co. (WEPCO), an equal partnership between Amoco U.A.R. Oil Company (AMOCO) and the Egyptian General Petroleum Company (EGPC), found natural gas in an Abu Qir well, about 6 miles northeast of Alexandria in 1965. WEPCO has withdrawn from the venture and EGPC was making feasibility studies for using gas from the well to fuel powerplants in Alexandria. The partnership Agip and EGPC found natural gas at Abu Madi in the

North Delta (Nile) in 1967. In 1971 an Agip subsidiary signed a contract to build a gas treating plant and use the gas for production of fertilizers. Details for the project will be worked out in the near future.

The extent and the significance of the Abu Ghardig gas were not determined at yearend. If further exploration confirms the first results, the gas may be used in Cairo. A 250-mile pipeline is planned to deliver the gas to Cairo and vicinity.

The associated gas from fields in the Gulf of Suez is far from markets and has been flared since the beginning of oil producton. Preliminary studies were underway to determine possibilities of marketing the available gas. Some plans about liquefying Gulf of Suez gas were being considered.

Petroleum.—Although production from the offshore El Morgan field in the Gulf of Suez, the major field in the country decreased significantly, the Gulf of Suez remained the principal oil-producing area in Egypt. The intensive exploration in the Western Desert of Egypt in the vicinity of the Libyan border brought in discoveries of two new oil fields. Abu Ghardig field was discovered by WEPCO and the Yidma field by Phillips Petroleum Oil Company (Phillips). The Government of Egypt maintained favorable conditions for foreign investments, and the latest information available from the Egyptian press revealed some optimistic targets for the country's petroleum industry. Reportedly, to reach oil production of 1 to 1.2 million barrels per day by 1982, an investment of $1.15 billion will be necessary. The greater part of these large investments required has to come from foreign sources because it is difficult for a war-oriented economy in a developing country to generate financial resources adequate enough to develop a petroleum industry at such speed.

During fiscal year 1970–71, the latest year for which data were available, the output of crude oil was 330,000 barrels per day. About 275,000 barrels per day came from the offshore El Morgan field. Another 30,000 barrels per day was produced from the state-owned General Petroleum Company (GPC) oilfields located onshore on the African side of the Gulf of Suez. The fields in Sinai (Balyim and others) were occupied by the Israelis and no data on their performance were available.

The El Alamein oilfield, the only field producing oil in the Western Desert of Egypt, added another 25,000 barrels of oil per day to the total crude oil production of Egypt. During the 1970–71 fiscal year the petroleum industry employed about 29,000 persons. Total capital investments in the industry were equivalent to $834.3 million. The foreign capital share totaled about 17 percent, or an equivalent to $148.1 million. The closure of the Suez Canal makes the exports of Egyptian crude difficult. Most of it is produced south of the canal in the Gulf of Suez and has to be transported around Africa to reach European and Mediterranean markets. Consequently, Egyptian crudes were sold at prices below world market prices in order to remain competitive.

At the beginning of 1971 there were 11 drilling rigs in operation and most of their activities were concentrated in the Western Desert where two new fields were discovered.

With the third well drilled on the structure, AMOCO in partnership with EGPC announced a discovery at Abu Gharadig, about 160 miles west of Cairo and about 57 miles south of the El Alamein oilfield. The well has two pay zones. The shallower sands at about 9,057 feet flowed 41° API with 0.38 percent low sulfur crude at a rate of 3,175 barrels per day through a ½″ bottom-hole choke. The second zone at 9,607–9,693 feet (Upper Cretaceous) flowed about 3,840 barrels per day of crude (37° API also with low sulfur). The size of the field was estimated to be about 8 square miles and reserves were estimated at 400 million barrels. The field is expected to be in production at the end of 1972 at a rate of 50,000 barrels per day. A relatively short pipeline will bring Gharadig oil to the El Alamein field, from where the existing pipeline will move the oil to loading facilities on the Mediterranean.

Phillips discovered a new field at Yidma. The flow of 42° API gravity oil was from an interval of the Alamein sands from a depth ranging from 8,497 to 8,502 feet. The well was flowing at the rate of 1,000 barrels per day. Later in the year the well went into production at a rate of 850 barrels per day. The oil from Yidma is brought to the El Alamein field oil gathering facilities by a newly built pipeline. Six new wells were planned for Yidma field and the output is expected to reach 8,000 barrels per day in 1973. In addition to Yidma discovery, Phillips announced a gas discovery in its well, Busayli No. 1, located 6 kilometers south of the town of Rashid and 20 kilometers from the Abu Qir offshore gasfield. No details on well performance were made public during 1971.

The Egyptian EGPG, with technical and financial assistance from the U.S.S.R., concentrated exploration in the Siwa area of the Western Desert. Six drilling rigs from the U.S.S.R. arrived in the Siwa area during 1971. The Soviets intend to intensify exploratory drilling in the area. Except for some gas shows in the East Faghour well, all wells completed in the Siwa region were dry.

The Japanese interest, the North Sumatra Oil Development Corp. (NOSODECO), completed drilling of its first exploratory well south of Ras Gharib in the Gulf of Suez. The offshore well was abandoned as dry.

The new refinery in Alexandria, in operation since 1970, completed trial production at its bitumen plant in 1971. The new facility will start regular production at the rate of 130,000 tons of bitumen per year. The Egyptian authorities believe the output of the new bitumen plant will eliminate imports in the future.

The problem of transporting Egyptian crude oil remained with the oil industry and hampered the realization of full economic benefits derived from its operations in 1971. To alleviate the problem, the Government has organized a domestic tanker company. When ship-building plans are completed, the new organization will operate 30 tankers. At yearend, three tankers were under construction in Egyptian shipyards.

The long negotiations related to the construction and financing of the Suez-Mediterranean pipeline (SUMED) were finalized in 1971. The completion of the project is expected in 1974. The SUMED pipeline will connect a new petroleum port at Sohna, 25 miles south of Suez with another new oil port near Alexandria. The capacity of the 42-inch pipeline will reach 1.2 million barrels per day. One pump station will be located at Sohna and another near Cairo. The French construction company Batignole has received the main contract for the pipeline construction. There is a possibility that a second 42–inch parallel line will be built and that the capacity of the pipeline will be increased to 2.4 million barrels per day.

The Mineral Industry of Finland

By F. L. Klinger [1]

Slackened demand in Finland's export markets, coupled with strikes in the domestic metal and construction industries, had depressing effects on the Finnish mineral industry in 1971. Mine and smelter output of most metals was below 1970 levels. Trade in mineral commodities also declined, but the overall deficit increased mainly because of rising costs of imported fuel.

Despite these adverse developments, Finnish productive capacity continued to improve. The development of new mines for iron, nickel, and copper was continued; a new oxygen steelworks was completed at Koverhar; new rolling mills for steel were nearing completion at Raahe and Hämeenlinna; and additional plants for production of basic chemicals for fertilizer were under construction at Siilinjärvi.

Significant actions taken by the Government in 1971 included contracts signed with Soviet firms for importation of natural gas by pipeline from the Soviet Union, beginning in 1974; construction of a second blast furnace at Raahe by 1976; and supply of a second nuclear powerplant, to be built at Loviisa by 1978. The Government also decided to build a plant for production of stainless steel at Tornio by 1976. On December 18, the Finnish markka was devalued about 5.6 percent against gold.

PRODUCTION

Preliminary production indices for major sectors of the mineral industry in 1971, and revised indices for 1969 and 1970, were as follows:

Sector	(1959 =100)		
	1969	1970	1971
Mining and quarrying	168	179	159
Basic metal industry	296	334	281
Nonmetallic mineral processing	281	328	314
Chemicals	285	328	351
All industry	207	228	227

Source: Central Bureau of Statistics (Helsinki). Bulletin of Statistics (Tilastokatsauksia), No. 3, 1972, pp. 8–9.

The relatively low indices for the mining and quarrying and basic metals sectors in 1971 were primarily caused by a strike, which halted production at metal mines and smelters during parts of February and March. Output of metallic ores and concentrates, iron, steel, and nonferrous metals during this 2-month period was less than 20 percent of normal levels. The strike also had serious effects on the metal manufacturing industries and on production of sulfuric acid which is largely a byproduct of smelting.

Other factors leading to reduced production in 1971 included a decline in foreign demand for Finnish exports of minerals and metals and a 17-day strike by building workers which affected the construction industry. Initial production of petrochemicals and plastics, and an increase in output of petroleum refinery products, contributed to production gains in the chemicals sector.

Production of mineral commodities is detailed in the following table.

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[1] Physical scientist, Division of Ferrous Metals.

Table 1.—Finland: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971 [p]
METALS			
Cadmium, refined	--	89	120
Chromium, chromite concentrate:			
Gross weight	71,326	120,509	111,988
Chromic oxide content	30,100	50,614	48,267
Cobalt:			
Mine output, metal content [e]	1,200	1,300	1,100
Metal, refined	778	1,008	925
Copper:			
Mine output, metal content	33,135	30,935	28,422
Metal:			
Primary:			
Unrefined	[r] 34,560	34,728	32,984
Electrolytic	33,877	34,047	32,339
Secondary (unrefined)	12,330	14,844	14,969
Gold, troy ounces	18,872	20,319	17,490
Iron and steel:			
Iron ore:			
Magnetite concentrate, thousand tons	588	585	530
Pelletized iron oxide (from pyrite), do	296	275	215
Roasted pyrite (purple ore), do	123	148	135
Pig iron, do	1,162	1,164	1,029
Ferrochromium, do	26	33	35
Steel:			
Crude:			
Ingots, do	968	1,169	1,025
Castings, do	19	18	16
Semimanufactures (rolled), do	713	798	620
Lead, mine output, metal content	4,553	5,005	4,739
Mercury, 76-pound flasks	--	[e] 100	135
Nickel:			
Mine output, metal content	3,625	5,111	3,600
Sulfate, metal content	191	150	123
Metal, electrolytic	3,722	4,009	3,890
Platinum, troy ounces	--	[e] 645	[e] 600
Rare-earth metals, lanthanide concentrate:			
Gross weight	10,117	6,750	1,244
Oxide content	855	163	85
Selenium, kilograms	6,197	6,946	6,273
Silver, troy ounces	624,945	739,755	622,663
Titanium concentrate, ilmenite, gross weight	138,200	151,000	139,500
Vanadium pentoxide:			
Gross weight	2,403	2,348	1,979
Vanadium content	1,346	1,315	1,109
Zinc:			
Mine output, metal content	70,800	62,609	50,020
Metal	1,084	55,820	63,702
NONMETALS			
Asbestos	14,050	13,625	10,360
Cement, hydraulic, thousand tons	1,759	1,839	1,811
Diatomite	[r] 1,820	666	--
Feldspar	53,398	62,126	64,062
Fertilizer materials, manufactured:			
Nitrogenous, thousand tons	188	215	NA
Phosphatic, do	215	215	NA
Mixed and other, do	934	830	NA
Lime, do	213	230	[e] 230
Mica	20	--	--
Pyrite:			
Gross weight, thousand tons	[r] 974	971	[e] 850
Sulfur content, do	447	444	[e] 440
Stone:			
Limestone:			
For cement, do	[r] 2,411	2,685	2,348
Other uses, do	1,308	1,488	1,405
Quartz, do	81	87	86
Sulfur, byproduct (recovered):			
Elemental	111,841	114,822	101,456
Gaseous (in SO_2)	192,846	212,612	198,267
Talc	28,740	62,723	100,679
Wollastonite	5,200	6,051	5,549
MINERAL FUELS AND RELATED MATERIALS			
Coke, all types, thousand tons	127	127	[e] 127
Fuel briquets, do	30	[e] 30	[e] 30
Gas, manufactured, million cubic feet	2,363	2,095	1,800
Peat:			
For fuel use, thousand tons	120	97	[e] 100
For agricultural and other use, do	138	158	[e] 160

See footnotes at end of table.

Table 1.—Finland: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971 [p]
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	8,747	9,087	9,960
Jet fuel do	560	704	738
Kerosine do	85	70	56
Distillate fuel oil do	14,801	16,964	19,128
Residual fuel oil do	19,081	23,490	24,386
Liquefied petroleum gas do	[r] 658	673	677
Other do	3,647	4,920	4,318
Refinery fuel and losses do	4,324	4,587	NA
Total do	51,903	60,495	NA

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

TRADE

Exports and imports of most mineral commodities by Finland in 1971 were less than in 1970, but the net trade deficit attributable to this sector increased about 5 percent to approximately $530 million. This was due to relatively large increases in the cost of imported fuels, upon which Finland is highly dependent. The volume of fuels imported in 1971 was about 7 percent less than in 1970, but the total value (about $364 million) was 25 percent higher. The increased deficit in the fuels sector prevented a relatively important reduction in imports of steel products from improving the overall balance of trade.

The total value of mineral commodity exports was about 9 percent less than in 1970. This was partly due to reduced volume of exports, as in iron and vanadium ores, pig iron, steel products, nickel, and petroleum products, but it was also due to lower prices received for exports of aluminum, copper, and nickel. Compared with 1970 data, the average unit value of exports declined 27 percent for aluminum, 23 percent for copper, and 38 percent for nickel. Substantial increases in exports of aluminum semimanufactures, unwrought copper and zinc, cement, and manufactured fertilizers were recorded in 1971.

On December 18, 1971, the Finnish mark (Fmk) was devalued 5.65 percent against gold and revalued 2.4 percent against the U.S. dollar. The rate of exchange then became Fmk 4.10=US$1.00, compared with the previous rate of Fmk 4.20.

Finland's trade in mineral commodities for 1969 and 1970 is detailed in the accompanying tables.

Table 2.—Finland: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum including alloys:		
Scrap	1,048	815
Unwrought	607	25
Semimanufactures	3,703	5,028
Antimony, unwrought and semimanufactures	18	8
Chromium:		
Chromite	5	4,386
Metal including alloys, all forms	NA	--
Cobalt, unwrought and semimanufactures	806	703
Copper including alloys:		
Scrap	61	--
Unwrought including matte	6,470	3,743
Semimanufactures	16,135	14,612
Gold, unworked or partly worked troy ounces	113	--
Iron and steel:		
Ore and concentrate, except roasted pyrite	225,811	228,841
Roasted pyrite	5,058	2,402
Metal:		
Scrap	6,272	4,402
Pig iron, ferroalloys, spiegeleisen, and similar materials	586,915	352,930
Steel, primary forms	46,232	205,993
Semimanufactures	201,857	218,410
Lead:		
Ore and concentrate	5,607	7,915
Metal including alloys:		
Scrap	--	202
Unwrought	33	161
Semimanufactures	22	4

See footnote at end of table.

Table 2.—Finland: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS—Continued		
Mercury 76-pound flasks	3	--
Nickel including alloys:		
Scrap	2	--
Unwrought	3,546	3,720
Semimanufactures	55	--
Platinum group including alloys troy ounces	730	--
Silver including alloys do	3,627	289,999
Tin including alloys:		
Scrap long tons	22	21
Unwrought do	4	20
Titanium:		
Ore and concentrate	13,022	24,667
Oxides	3,539	3,583
Vanadium oxides	2,779	2,798
Zinc:		
Ore and concentrate	133,519	2,111
Oxide	11	24
Metal:		
Scrap	60	50
Unwrought	--	44,235
Other:		
Ore and concentrate of base metals n.e.s	10	20
Ash and residue containing nonferrous metals	28,965	19,784
Waste and sweepings of precious metals kilograms	1,377	17,035
NONMETALS		
Asbestos	11,949	9,335
Cement	32,959	14,538
Clay products:		
Refractory (including brick)	1,253	515
Nonrefractory	4,149	1,976
Diamond:		
Industrial carats	4,500	--
Other do	500	--
Diatomite and other infusorial earths	58	44
Feldspar	46,057	59,915
Fertilizer materials, manufactured:		
Nitrogenous	15,953	17,866
Phosphatic, other than Thomas slag	31,717	3,223
Other including mixed	180	4,186
Graphite, natural	12	12
Lime	1,080	307
Mica, crude including splittings and waste	56	--
Precious and semiprecious stones, except diamond:		
Natural carats	251,300	225,000
Manufactured do	1,000	10,000
Pyrite (gross weight)	91,215	17,517
Sodium and potassium compounds n.e.s.:		
Caustic soda	4,053	2,551
Caustic potash	(1)	1
Stone, sand and gravel:		
Dimension stone	13,267	15,916
Other stone:		
Limestone	17,331	21,249
Quartz and quartzite	159	208
Crushed, broken, and gravel n.e.s	430	3,494
Sand, excluding metal bearing	668	234
Sulfur:		
Elemental forms including colloidal and sublimed	38,378	68,177
Sulfuric acid	4,212	74,303
Talc and steatite	182	1,761
Other nonmetals n.e.s.:		
Slag, dross and similar waste, not metalbearing:		
From manufacture of iron and steel	2,843	596
Slag and ash, n.e.s	546	81
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	1,038	3,179
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	20	30
Coal, all grades including briquets	1,836	32
Coke and semicoke	48,345	--
Peat and peat briquets	2,304	7,501
Petroleum refinery products:		
Gasoline (including naphtha) thousand 42-gallon barrels	2,370	816
Distillate fuel oil do	715	283
Residual fuel oil do	293	--
Lubricants do	8	6
Liquefied petroleum gas do	64	83
Bitumen do	26	1
Other do	1	2,755
Mineral tar and other coal, petroleum, or gas derived crude chemicals	1,500	2,508

NA Not available.

[1] Less than ½ unit.

Table 3.—Finland: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum:		
Ore and concentrate	1,224	1,016
Oxide and hydroxide	16,508	15,404
Metal including alloys:		
Scrap	24	24
Unwrought	15,218	18,713
Semimanufactures	r 17,420	20,117
Antimony metal including alloys, all forms	78	23
Arsenic trioxide, pentoxide, and acids	56	294
Cadmium metal including alloys, all forms	9	4
Chromium:		
Chromite	3,732	1,384
Oxide and hydroxide	390	559
Cobalt:		
Oxide and hydroxide	r 3	(1)
Metal including alloys, all forms	6	9
Copper:		
Ore and concentrate	483	11
Copper sulfate	477	904
Metal including alloys:		
Scrap	--	33
Unwrought	7,688	14,305
Semimanufactures	3,198	3,543
Gold unworked or partly worked ... troy ounces	78,641	76,261
Iron and steel:		
Ore and concentrate, except roasted pyrite	1,206,209	747,551
Roasted pyrite	782	--
Metal:		
Scrap	92,997	136,106
Pig iron including cast iron	1,560	960
Sponge iron, powder and shot	2,944	4,471
Ferroalloys	20,749	24,330
Steel, primary forms	r 35,663	35,456
Semimanufactures:		
Bars, rods, angles, shapes, sections	205,337	325,749
Universals, plates and sheets	312,920	324,712
Hoop and strip	41,097	36,706
Rails and accessories	r 1,128	2,346
Wire	16,360	19,716
Tubes, pipes, and fittings	r 93,430	137,877
Castings and forgings, rough	r 669	1,154
Lead:		
Ore	--	505
Oxides	639	605
Metal including alloys:		
Unwrought	10,574	12,262
Semimanufactures	2,018	960
Magnesium metal including alloys, all forms	46	34
Manganese:		
Ore and concentrate	56,619	14,398
Oxides	1,210	1,376
Mercury ... 76-pound flasks	1,813	1,540
Molybdenum metal including alloys, all forms	2	3
Nickel:		
Ore and concentrate	4,818	6,829
Metal including alloys:		
Scrap	24	154
Unwrought	104	243
Semimanufactures	179	216
Platinum group ... thousand troy ounces	20	6
Silver metal including alloys ... do	2,346	2,311
Silicon	301	290
Tin:		
Oxides ... long tons	r 10	34
Metal including alloys:		
Scrap	23	21
Unwrought ... long tons	345	341
Semimanufactures ... do	52	43
Titanium:		
Ore and concentrate	60	243
Oxides	48	117
Tungsten metal including alloys, all forms	9	28
Zinc:		
Oxides	370	262
Metal including alloys:		
Unwrought and scrap	9,620	3,212
Semimanufactures	700	581
Other:		
Ore and concentrate	5,234	73
Metals including alloys, all forms:		
Metaloids n.e.s	79	--
Pyrophoric alloys	1	1
Base metals n.e.s	149	141

See footnotes at end of table.

Table 3.—Finland: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970
NONMETALS		
Abrasives, natural n.e.s. ... value, thousands	$187	$187
Asbestos	4,727	7,744
Barite and witherite	492	526
Borates, crude, natural	5,202	5,650
Cement	5,155	7,698
Chalk	10,179	9,719
Clays and products (including all refractory brick):		
Crude	275,351	353,228
Products:		
Refractory (including brick)	44,524	52,172
Nonrefractory ... value, thousands	$898	$359
Cryolite and chiolite, natural	142	67
Diamond:		
Gem not set or strung ... value, thousands	$314	$1,232
Industrial ... do	$202	$759
Diatomite	926	1,124
Fertilizer materials:		
Crude, phosphate	507,684	394,420
Manufactured:		
Nitrogenous	106,706	56,927
Phosphatic: Thomas (basic) slag	11,430	9,589
Potassic	182,322	219,459
Other including mixed	79,416	56,899
Fluorspar	6,590	7,462
Graphite, natural	329	628
Gypsum and plasters	128,644	88,003
Lime	35	56
Magnesite	2,382	2,971
Mica, all forms	726	780
Pigments, mineral:		
Natural, crude	82	70
Iron oxides, processed	1,564	1,698
Precious and semiprecious stones, except diamond:		
Natural ... value, thousands	$247	$233
Manufactured ... do	$108	$127
Salt (excluding brine)	427,298	490,416
Sodium and potassium compounds n.e.s.:		
Caustic soda	24,092	23,749
Caustic potash	254	298
Stone, sand and gravel:		
Dimension stone	3,913	3,488
Dolomite, chiefly refractory grade	3,581	6,450
Gravel and crushed rock	1,533	1,891
Limestone, except dimension	255,941	283,225
Quartz and quartzite	3,526	3,590
Sand excluding metal bearing	88,700	90,975
Sulfur:		
Elemental	39,115	37,235
Sulfuric acid	33	34
Talc and steatite	6,049	6,159
Other nonmetals n.e.s.:		
Slag, dross and similar waste, not metalbearing:		
From manufacture of iron and steel	668	2,050
Slag and ash n.e.s	--	100
Oxides and hydroxides of magnesium, strontium, and barium	5,972	8,203
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	620	375
Carbon black	4,789	5,635
Coal, all grades including briquets ... thousand tons	2,464	3,223
Coke and semicoke ... do	762	843
Petroleum:		
Crude and partly refined ... thousand 42-gallon barrels	51,980	70,245
Refinery products:		
Gasoline ... do	172	154
Kerosine and jet fuel ... do	116	146
Distillate fuel oil ... do	14,007	13,816
Residual fuel oil ... do	6,009	7,592
Liquefied petroleum gas ... do	122	132
Lubricants ... do	551	520
Other [2] ... do	1,615	2,491
Mineral tar and other crude chemicals derived from coal, petroleum or gas thousand tons	15	15

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[r] Revised.

[1] Less than ½ unit.

[2] Includes other finished products and unfinished oils requiring further processing, including topped crude.

COMMODITY REVIEW

METALS

Chromium.—Although production of chromite in 1971 was 7 percent less than in the previous year, consumption appeared to increase as exports of chromite rose to 37,000 tons and there was a 10-percent increase in production of ferrochrome. Exports of ferrochrome declined to 26,400 tons.

Cobalt.—There was a 47-percent increase in exports of cobalt in 1971 despite reduced production at Kokkola. Exports of metal totaled 1,036 tons valued at approximately $5.29 million. The average unit value of exports was 7 percent less than in 1970.

Copper and Nickel.—The decline in mine output of copper and nickel in 1971 was due mainly to a drop of 20 percent in production of copper concentrate at Outokumpu and a 10-percent reduction in output of nickel and copper concentrates at Kotalahti. These losses were partially offset by increased production of copper ore at Virtasalmi and of low-grade nickel-copper ores at Hitura and Kylmäkoski. The latter mine began production in April 1971 but the ore body is small and reportedly will be mined out in 3 years. Opening of the new Vuonos mine, which is expected to yield significant quantities of nickel in 1972 and copper in 1973, was apparently delayed.

Exports of unwrought and semimanufactured forms of copper in 1971 increased to 20,183 tons while exports of nickel declined slightly to 3,455 tons. Owing to lower prices for both metals, the values of exports declined by about $5 million for copper and $7 million for nickel, compared with those of 1970.

Iron Ore.—The decline in domestic production of iron ore in 1971 was accompanied by an 88-percent reduction in exports and a 20-percent increase in imports, so that the apparent domestic supply increased to 1.75 million tons, 15 percent more than in 1970.

In 1971 discussions were held between Finland and the Soviet Union regarding possible Finnish exploitation of the Kostomus iron deposits in Soviet Karelia. The Finnish company involved was Rautaruukki Oy. Exploitation of the deposits, which are located about 400 kilometers east of the company's steelworks at Raahe, may require construction of a railroad, a pelletizing plant, and a townsite. No decision was announced by yearend. Iron ore resources in the Kostomus area reportedly total 1.5 billion tons, with an average iron content of 30 percent.[2] The material was described as easily beneficiated magnetite ore, amenable to open pit mining.

Iron and Steel.—A decline of 12 percent in output of pig iron and crude steel in 1971 was accompanied by a 40-percent drop in exports of pig iron and a 25-percent decrease in imports of steel semimanufactures, compared with the levels of 1970. Exports of steel semimanufactures were only about 2 percent less than in the previous year. The net deficit attributable to iron and steel trade was reduced to about $94 million, compared with $145 million in 1970.

The oxygen steelworks at Koverhar was completed in mid-1971 by the Ovako Co. The plant includes two 60-ton Linz-Donawitz converters and two 4-strand continuous casting machines and increases the company's steelmaking capacity to 630,000 tons per year.

Rautaruukki Oy. planned to install a second blast furnace at Raahe by 1975. The furnace will be supplied by the Soviet Union, and is expected to double the company's pig iron production capacity to about 1.5 million tons per year. A new oxygen plant and lime-burning plant will be added to the works in 1974. The company's hot-rolling mill apparently became operational in December. The mill has a production capacity of 230,000 tons per year. The cold-rolling mill being constructed at Hämeenlinna was nearly completed by yearend; this plant has a production capacity of 200,000 tons per year.

Rautaruukki was also considering production of a large-diameter steel pipe, for use in construction of the natural gas pipeline in Finland (see Mineral Fuels section—Natural Gas) and for export to the Soviet Union. The company does not have pipemaking facilities at present. Pipe needed for the natural gas project is expected to be manufactured in Sweden, using steel sheet supplied by Rautaruukki.

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[2] United Nations (New York). Survey of World Iron Ore Resources. 1970, pp. 385–392.

Oy. Wärtsilä Ab. was planning to replace its rolling mill at Taalintehdas (Dalsbruk) with a new plant by 1974. The new mill will reportedly increase the company's production capacity for bars to 150,000 tons per year.

Outokumpu Oy. was expected to begin construction in 1972 of a plant for production of stainless steel. Although originally planned to be located at Pori, where the company operates rolling mills for copper and brass, the plant is now to be located at Tornio where Outokumpu has produced ferrochromium since 1968. The proposed plant is reportedly to have a production capacity of 50,000 tons of stainless steel per year, and is scheduled for completion by 1976. The plant's output will initially be hot-rolled at Raahe by Rautaruukki Oy. Finnish consumption of rolled stainless steel was reported to be about 20,000 tons per year, all of which is presently imported.

In other developments, Kuusakoski Oy. was reported to be installing a shredder for processing scrap automobiles. The facility has a production capacity of 40,000 tons of shredded scrap per year and is expected to be operating by the end of 1972.

Lead, Zinc, and Associated Metals.—Production of lead concentrate declined only 5 percent in 1971 but exports declined 45 percent in quantity and 60 percent in value compared with the levels of 1970. Output of rare-earth concentrates, a byproduct of lead ore mined at Korsnas, declined by 82 percent.

Despite reduced mine production, output and exports of cadmium and slab zinc were well above the levels of 1970. Customs statistics revealed that relatively large quantities of zinc concentrates (76,436 tons) were imported for the first time in 1971. Exports of slab zinc rose to 56,147 tons, valued at $17.5 million. Exports of cadmium increased to 99 tons, valued at $389,000.

Mercury.—Mercury was produced as a byproduct of zinc concentrates smelted at Kokkola. The recovery plant was built in 1970, after an unacceptably high concentration of mercury (20 to 100 parts per million) was found in sulfuric acid manufactured from the zinc smelter gases. The zinc concentrates were also reported to contain 50 to 200 parts per million of mercury. The recovery process removes over 99 percent of the mercury from the gas by precipitating it as a sulfate. Iron, zinc, and selenium are also removed. The process is patented by Outokumpu Oy. and is marketed by Lurgi G.m.b.H. of West Germany.

Vanadium.—Rautaruukki Oy. was planning to develop a new mine source of vanadium, about 200 kilometers north of Otanmäki. The deposit, to be mined by open pit methods, consists of vanadium-bearing titaniferous magnetite similar to that now mined at Otanmäki but of lower overall grade. Ore reserves are tentatively estimated at several tens of millions of tons. Anticipated production is about 3,000 tons of vanadium pentoxide per year, beginning about 1976.

NONMETALS

Cement and Other Construction Materials.—Partly as a result of a strike which idled 20,000 construction workers in the spring, output and consumption of several construction materials declined in 1971. Domestic sales of cement were 6 percent less than in 1970, but exports of cement increased three-fold to 77,000 tons. Imports of gypsum, clays, feldspar, and quartz declined, but production and exports of glass were increased.

While the total number of buildings completed was about 5 percent less than in 1970, a relatively high level of construction actively was evident by the end of the year, especially in residential construction which was stimulated by State housing loans. At yearend, the number of housing units under construction and planned was 13 percent higher than a year earlier.

Imports of asbestos and talc were slightly more than in 1970, but exports of both minerals also increased in 1971.

Fertilizer Materials.—Rikkihappo Oy. continued to expand its chemical fertilizer works at Siilinjärvi in 1971. Plants under construction included one for production of concentrated compound fertilizers (capacity 200,000 tons per year) and a nitric acid plant (capacity 80,000 tons per year). Both plants were scheduled for completion by the end of 1972. At the same locality, the company planned to start construction of a second 75,000-ton-per-year phosphoric acid plant in 1972. At the Kokkola works, a 200,000-ton-per-year compound-fertilizer plant was completed at yearend 1970.

Imports of crude phosphate in 1971 increased 45 percent compared with those of 1970, while imports of potassium salts rose 12 percent and imports of other fertilizers declined. Exports of nitrogenous and compound fertilizers increased threefold.

MINERAL FUELS

Coal and Coke.—The quantity of solid fuels imported in 1971 was 10 percent less than in 1970, but the total value increased 27 percent, to about $77 million. The increase in average unit value of imports was 62 percent for coal and 24 percent for coke. The decline in imports of coal was partly due to lower demand from thermoelectric powerplants (there was increased availability of hydroelectric power) and from the forest products industries, while consumption of coke in the metallurgical industry was 20 percent less than in 1970.

Consumption of coal and coke in 1970 and 1971 was reported as follows in thousand metric tons:

Consuming sector	1970	1971
Coal:		
Electric power generation	1,258	1,113
Paper and woodworking industry	638	563
Other industries	505	492
Gas and coke manufacturing	132	142
Space heating	136	298
Locomotive fuel	50	28
Total	2,719	2,636
Coke:		
Metals reduction	804	641
Other	73	59
Total	887	700

Source: U.S. Department of State (American Embassy, Helsinki). Airgram A–079, Mar. 16, 1972.

Natural Gas.—An agreement for the import of natural gas by pipeline from the Soviet Union was concluded by Finland in 1971. The agreement covers a period of 20 years, with contracted deliveries scheduled to begin at the annual rate of 500 million cubic meters in 1974, increasing to 1,400 million cubic meters in 1979, and continuing at that rate through 1993. Exclusive rights to purchase and distribute Soviet gas were assigned by the Finnish Government to Neste Oy.

The price of the gas was not announced, but Finland will pay for it by deliveries of large-diameter steel pipe. The pipe will be provided by Rautaruukki Oy. Initially, the pipe will be manufactured abroad, using sheet supplied by Rautaruukki, but eventually the pipe will be manufactured in Finland at the Raahe works of the company.

The gas will be piped from the vicinity of Leningrad, entering Finland near the city of Imatra. From Imatra the pipeline will extend to Riihimäki (a distance of approximately 230 kilometers) via Lappeenranta, Kouvola, and Lahti. From Riihimäki, branches will run north to Tampere (about 100 kilometers) and south to Helsinki (about 65 kilometers). Other branches are planned, from Helsinki to Lohja, from Kouvola to Kotka, and from Lahti to Heinola. The first 180 kilometers of the pipeline is expected to be completed early in 1974.

Nuclear Energy.—Imatran Voima Oy., the State-owned power company, ordered a second nuclear powerplant from the Soviet Union in 1971. The plant will be built at Loviisa, adjacent to the first plant which is now under construction, and is scheduled for completion in March 1978. Both plants are of similar design, having pressurized-water reactors and generating capacities of 440 megawatts of electricity. The first plant is now scheduled for completion in June 1976.

The contract for the second plant, signed with the Soviet firm V/O Technopromexport, includes a 20-year agreement for supply of enriched uranium fuel for the first plant and provisions for future supply of the second.

Renewed interest was indicated in uranium prospecting in Finland. A special Government committee was formed in 1971 to coordinate prospecting activities. Northern Finland was reported to be the most promising area for exploration. In the last 15 years, uranium deposits were investigated in southern and eastern Finland in the parishes of Perno, Askola, and Eno, but although some uranium oxide was produced, none of the deposits proved to be economic.

Petroleum.—The share of petroleum in Finland's total consumption of energy remained at about 54 percent in 1971. Imports of crude oil (8.95 million tons) were 8 percent less than in 1970, but the total quantity processed in Finland's two refineries increased 8 percent to 8.86 million tons. Imports of petroleum products declined slightly, but exports were reduced by 56 percent. Total consumption of refinery products increased about 3 percent, to 10.4 million tons.

Neste Oy., the State-owned refining company, concluded a new contract with the Soviet firm V/O Sojuznefteexport for delivery of 30.1 million tons of crude oil during the period 1971–75. Deliveries under the previous contract, which expired in 1970, were about 36 percent more than originally scheduled. Of the total crude oil processed in Finland during 1971, about 67 percent came from the Soviet Union, 30 percent from Iran, and the remainder was of Venezuelan and Saudi Arabian origin.

Increases in the cost of crude oil, refined products, and in ocean freight rates drove up the average unit value of Finnish imports in 1971 by nearly 34 percent for crude oil and 31 percent for refined products, compared with 1970 levels. An increasing share of Finland's crude oil requirements was expected to be carried by chartered tankers, although Neste Oy. added two 114,000-ton vessels to its fleet during 1970. About 55 percent of the company's crude oil requirements were carried by chartered tankers in 1970.

Production of refined products in 1971 was about 6 percent more than in 1970. The principal gains were registered in fuel oils and premium-grade gasoline, while output of naphtha was 25 percent less. As in 1970, about two-thirds of the total output was produced at Porvoo and the remainder was produced at Naantali. Both refineries are owned by Neste Oy. and have a total processing capacity of about 9.5 million tons annually. Sales of petroleum products by this company reportedly accounted for 78.5 percent of total Finnish consumption in 1971 (80 percent in 1970). The company was studying the feasibility of constructing a third refinery.

Total consumption of petroleum products in Finland in 1970 and 1971 were reported as follows in thousand metric tons:

Product	1970	1971
Motor gasoline	1,026	1,074
Naphtha and solvents	113	148
Kerosine, including jet fuel	87	104
Light fuel oil, including diesel oil	4,061	4,024
Heavy fuel oil	4,289	4,538
Liquefied petroleum gases	62	65
Bitumen products	309	327
Other	121	116
Total	10,068	10,396

Source: Annual Reports of Neste Oy. for 1970 and 1971.

The Mineral Industry of France

By E. Shekarchi [1]

Output of most minerals and metals in France decreased in 1971, discontinuing the general upward trend of the last decade. Nevertheless, France was the leading producer of iron ore, bauxite, aluminum, sulfur, and some quarry products in Western Europe.

The gross national product (GNP) was estimated at $176.6 billion in 1971 [2] compared with $160 billion in 1970.[3] Per capita GNP, also in current prices, was up 9.6 percent from $3,100 in 1970 to $3,400 in 1971.

The major development in the mineral processing industry in 1971 was the start of the Fos-sur-Mer industrial complex on the Mediterranean. This complex will cover 50,000 acres of bucolic tidewater land which stretches from Marseille to the Spanish border. One of the early developers was Ugine Aciers division of Péchiney-Ugine Kuhlmann which completed a $260 million specialty steel plant in 1971. The Solmer division of Wendel-Sidelor Steel Co. was in the process of erecting a $1.5 million steel plant at the complex.

Investment of foreign capital in France is regulated by the Ministry of Finance, which recently set up new rules for such transactions. The ministry now favors foreign investments which contribute technological knowledge, provide jobs in areas of high unemployment, and increase the country's export capacity. They will not approve foreign investment in elecronics, petroleum, and telecommunications, or investments which give a foreign company a monopoly position in an important industry. Over the last year, the need to restrict the inflow of foreign capital, particularly dollars, in order not to swell France's large foreign currency reserves even further, has been added to the list of rules.

The sixth economic plan of French industry (1971–75), introduced in 1970, recommended spending for research and development 2.8 percent of the GNP by 1975. In 1971, total research and development expenditures amounted to an estimated $3.5 billion, of which 65 percent was supported by the Government. The Government's share fell into two categories—the first, a programed sector which in 1971 included atomic energy, space, oceanography, transportation, and environmental pollution; and the second, a nonprogramed sector composed chiefly of defense research and development and university research.

The Commissariat à l'Énergie Atomique (CEA) will remain the largest single government research and development organization. The CEA nonmilitary research authorization for 1972 will approach $300 million, equal to 30 percent of the civilian science budget. Electric energy production will continue as the unique emphasis of CEA research, with a recommended program funding of $770 million for 1971–75. The CEA with the abandonment of its natural-uranium power reactor line in 1971 turned its attention to the assimilation of technology for light water enriched uranium reactors scheduled for constrution in France under a U.S. license.

During 1971 a number of labor laws were enacted to improve the labor and management relationship in all sectors of French industry, including mineral and metal operations. The law of July 13, 1971, amended and supplemented the law of 1950 which established the basic framework for collective bargaining. The act identifies collective bargaining as a "right" and permits the Minister of Labor to summon labor and management to negotiation when requested to do so by one or more organizations or on his own initiative. The act denies the unions, which are not recognized as nationally representative, the right to stand as the sole labor interlocutor in collective bargaining.

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[1] Physical scientist, Division of Ferrous Metals.

[2] U.S. Embassy, Paris. State Department Dispatch A–485, May 15, 1972, p. 2.

[3] Where necessary, values have been converted from French francs (Fr) to U.S. dollars at the rate of Fr 5.1175=US$1.00.

The law passed by parliament on December 2, 1971, provided that the number of active years to be taken into account for the computation of pension payments will be gradually increased from 30 to 37.5 years by 1975 in order to permit an upward revision of maximum pension payments from 40 to 50 percent of taxable wage earnings. In accordance with this law, about 800,000 retired persons received a 5-percent pension increase at the beginning of 1972.

The law of December 24, 1971, reduced the maximum authorized number of weekly hours from 54 to 50, when calculated as an average over a period of 12 weeks. Under no circumstances can the workweek exceed 57 hours.

Effective January 1, 1972, all enterprises employing a minimum of 10 workers were required to invest 0.8 percent of their total payroll in training programs organized either at plant or at interindustry levels, under the control of worker representatives. By 1976, the rate of this obligation will reach 2 percent of the payroll, thus raising the total amount to be invested in training from $320 million in 1972 to $900 million in 1976. If the percentages above are not expended directly by the employer, they will be paid to special funds as a tax levy.

The problems arising out of the presence of 1.5 million foreign workers in French communities came into sharper focus with the rise of unemployment and reports of poor housing facilities available to immigrants. According to government reports, foreign workers residing in France provided 20 percent of industrial manpower and were classified as follows: 39 percent unskilled; 32.5 percent semiskilled; and 26 percent skilled.

At the request of the French president, metal and nonmetal policy planners were seeking ways to make French industry less vulnerable to the effects of political upheavals in foreign producing countries and fluctuating world market prices. A key recommendation was to give greater importance to Bureau de Recherches Géologiques et Minières (BRGM) programs of increased prospecting and research activities. The programs would be extended to include other minerals of strategic importance.

The new policy would be centered around France's two dominant mining and metallurgical conglomerates: Péchiney-Ugine Kuhlmann, a copper, aluminum, chemical, special steel, and alloy producer and Le Nickel-Peñarroya-Mokta, a producer of nickel, lead-zinc, and uranium. The Government aims are to give stronger technological support to these groups through the BRGM and to underwrite company efforts at development of mineral deposits and where necessary guarantee to provide aid for overseas investment in new areas.

The French Government also decided in principle to participate in financing of the international tin buffer stock agreement in 1971. Based on France's voting rights in the agreement, the Governments' contribution to the buffer stock fund would be around $3 million.

The Government agency, Groupement d'Importation et de Repartition des Métaux, (GIRM) planned to step up mineral exploration around the world and stockpile key commodities which the French industry will need. To accomplish this, the Government not only encourages large companies to become involved in exploration, but also offers them direct help to enter into negotiations with other countries. The priority so far has been given to those companies searching for copper and nickel.

PRODUCTION

The production of iron and steel, copper, and lead-zinc was generally lower in 1971 than in 1970. Among the fuels, the coal industry showed another decline, whereas a significant increase was apparent in the production of natural gas and petroleum refinery products. In table 1 the production of primary and processed metals and nonmetals is given.

Table 1.—France: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971 p
METALS			
Aluminum:			
Bauxite, gross weight ... thousand tons	2,773	2,992	3,184
Alumina ... do	r 1,105	1,130	1,215
Metal:			
Primary ... do	372	380	384
Secondary ... do	89	87	98
Antimony smelter production	2,129	2,222	1,526
Arsenic, white e	13,600	13,600	13,600
Bismuth metal ... kilograms	r 62,000	72,000	77,000
Cadmium metal	523	529	579
Cobalt metal	r 526	244	576
Copper:			
Mine output, metal content	389	250	300
Metal:			
Blister (secondary)	10,380	9,020	6,860
Refined:			
Electrolytic	28,900	27,852	25,820
Other	8,040	5,675	3,330
Total	36,940	33,527	29,150
Gold:			
Mine output, metal content ... troy ounces	54,946	62,726	65,620
Metal ... do	47,101	56,521	56,392
Iron and steel:			
Iron ore and concentrate ... thousand tons	55,425	56,805	55,862
Pig iron ... do	17,784	18,735	17,900
Blast furnace ferroalloys ... do	428	486	445
Electric furnace ferroalloys ... do	309	339	350
Steel ingots and castings ... do	22,511	23,773	22,859
Semimanufactures ... do	r 17,987	18,727	17,577
Lead:			
Mine output, metal content	30,200	28,820	29,770
Metal refined:			
Primary	107,930	119,936	108,310
Secondary	19,824	18,123	25,000
Antimonial lead (lead content)	28,050	31,886	27,180
Total refined lead	155,804	169,945	160,490
Magnesium metal including secondary	4,414	4,611	7,216
Nickel, metal content of metallurgical products (pure nickel, ferronickel, and nickel oxide)	9,606	10,952	9,941
Silicon	29,470	35,490	37,290
Silver:			
Mine output, metal content ... thousand troy ounces	r 2,396	2,282	2,109
Metal (content of final smelter products) ... do	4,135	4,812	3,611
Tin concentrate, metal content ... long tons	r 246	332	317
Tungsten concentrate, metal content	22	58	300
Uranium:			
Mine output, uranium content	r 1,360	1,340	1,300
Chemical concentrate, uranium content [1]	1,716	1,764	1,521
Vanadium (byproduct from bauxite) e	100	100	100
Zinc:			
Mine output, metal content	20,100	18,580	15,100
Metal including secondary:			
Slab	253,540	223,670	217,620
Dust	r 7,540	6,780	7,400
NONMETALS			
Alabaster	1,510	1,440	e 1,400
Asbestos e	500	500	500
Barite	r 94,800	94,780	110,000
Bromine, elemental	14,710	14,710	14,530
Cement, hydraulic ... thousand tons	27,543	28,858	28,822
Clays:			
Bentonite [2]	16,257	19,337	NA
Brick and tile ... thousand tons	10,647	10,352	NA
Ceramic and pottery	544,584	566,898	NA
Clay and marl for cement industry ... thousand tons	11,233	11,879	NA
Kaolin and kaolinite, crude	427,324	e 420,000	e 420,000
Refractory ... thousand tons	r 809	949	1,180
Diatomite e	170,000	170,000	170,000
Feldspar, crude	r 215,000	236,000	192,000
Fertilizer materials:			
Crude (natural):			
Phosphatic chalk	r 26,000	26,000	189,800

See footnotes at end of table.

Table 1.—France: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971 [p]
NONMETALS—Continued			
Fertilizer materials—Continued			
Crude (natural)—Continued			
Potash:			
Gross weight thousand tons	11,971	11,699	12,131
K_2O equivalent do	1,938	1,904	2,000
K_2O equivalent (marketable) do	1,794	1,768	[e] 1,780
Manufactured:			
Nitrogenous, nitrogen content do	1,406	1,344	1,501
Phosphatic			
Superphosphate do	1,297	NA	NA
Phosphate concentrates do	708	NA	NA
Thomas slag do	2,615	2,540	2,540
Potassic do	1,770	1,742	1,869
Mixed, gross weight do	6,456	6,684	7,466
Fluorspar, marketable [e]	275,000	290,000	300,000
Fly ash thousand tons	4,184	[e] 4,000	[e] 4,000
Gypsum and anhydrite, crude do	5,959	6,088	5,112
Lime, quicklime and hydrated including dead-burned dolomite do	4,187	4,372	[e] 4,400
Mica	[r] 2,069	3,098	[e] 4,600
Pigments, natural mineral, iron oxide	2,159	3,260	NA
Pumice	565	587	[e] 6,090
Pozzolana and lapilli	[r] 771,849	779,835	700,000
Pyrite:			
Gross weight thousand tons	85	85	82
Sulfur content do	35	35	34
Quartz and glass sand:			
Quartz	553,994	563,311	266,000
Glass sand thousand tons	[r] 1,670	2,220	4,200
Salt:			
Rock salt do	235	295	292
Brine salt do	869	933	845
Marine salt do	965	1,296	1,250
Salt in solution do	2,800	3,140	3,108
Total do	[r] 4,869	5,664	5,495
Stone, sand and gravel n.e.s.:			
Building stone:			
Granite and similar rocks do	[r] 1,153	1,042	NA
Limestone do	[r] 2,523	2,455	NA
Marble do	486	554	NA
Other do	39	29	NA
Crushed limestone and granite	4,581	3,426	NA
Dolomite:			
For agriculture	272,547	219,924	NA
Crude for calcining	635,400	724,774	NA
Other	674,530	647,979	NA
Total	1,582,477	1,592,677	NA
Limestone, agricultural and industrial:			
For agriculture thousand tons	490	564	NA
For iron and steel industry do	5,186	5,186	NA
For lime and cement do	29,747	31,024	NA
For sugar mills do	[r] 725	846	NA
Total do	36,148	37,620	NA
Road building, foundation and ballast (other than alluvial sand and gravel):			
Ballast do	75,361	83,574	NA
Foundation material do	5,299	1,551	NA
Ground rock, for road filler do	199	614	NA
Paving block and curving do	148	466	NA
Slate:			
Roof	[r] 121,897	120,734	NA
Other	56,683	30,288	NA
Other stone:			
Beach pebble	220,235	262,206	NA
Lava	8,925	8,301	NA
Marl	190	204	NA
Mine fill thousand tons	11,772	10,478	NA
Millstones and grindstones	2,159	1,287	NA
Sand and gravel:			
Industrial sands:			
Foundry thousand tons	[r] 1,671	1,828	NA
Miscellaneous do	[r] 627	702	NA
Other sand and gravel (alluvial):			
By dredging do	[r] 93,230	96,538	NA
By other winning methods do	[r] 90,607	96,284	NA

See footnotes at end of table.

Table 1.—France: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971 [p]
NONMETALS—Continued			
Sulfur, elemental, byproduct thousand tons	[r] 1,742	1,733	1,806
Talc:			
Crude	[r] 247,050	219,120	253,630
Powder	214,570	232,992	245,997
MINERAL FUELS AND RELATED MATERIALS			
Bituminous asphaltic material	117,880	124,573	[e] 128,000
Carbon black	137,200	148,700	156,400
Coal:			
Anthracite thousand tons	10,084	9,843	9,178
Bituminous do	30,499	27,511	23,836
Lignite do	2,950	2,785	2,752
Total do	43,533	40,139	35,766
Coke:			
Metallurgical do	[r] 13,613	14,161	12,510
Gashouse do	8	10	4
Total do	[r] 13,621	14,171	12,514
Coal briquets do	[r] 4,208	4,322	NA
Gas, natural:			
Gross production million cubic feet	346,223	363,174	[e] 374,334
Marketed do	229,756	242,964	252,428
Peat thousand tons	81	77	[e] 80
Petroleum:			
Crude thousand 42-gallon barrels	18,207	16,825	13,651
Refinery products:			
Aviation gasoline do	506	385	242
Motor gasoline do	104,266	112,273	114,410
Jet fuel do	22,742	23,294	22,216
Kerosine do	350	373	340
Distillate fuel oil do	257,697	295,893	301,962
Residual fuel oil do	157,864	183,229	216,337
Lubricants do	7,208	7,382	7,932
Liquefied petroleum gases do	25,446	28,301	27,132
Bitumen do	17,287	19,444	19,695
Other do	40,913	25,158	23,268
Refinery fuel and losses do	38,185	42,216	52,101
Total do	672,464	737,948	785,635

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] Produced in part from imported raw materials.

[2] Includes smectic clay.

TRADE

The currency realignment agreement reached at the Smithsonian Institution in December 1971 removed many of the uncertainties in the international monetary situation. It also brought about a net devaluation of the franc against all currencies amounting to 1.8 percent as compared with the exchange rate structure prevailing in May 1971. In practice, the immediate effect of this development on the French economy will be small. Nevertheless, in the long run it reinforces the competitive advantage France gained from the 1969 devaluation of the franc and successive revaluations of the Deutsche Mark. French exports increased in value from $18 billion in 1970 to $20.5 billion in 1971; whereas, French imports from all sources increased in value from $19.1 billion in 1970 to $21.2 billion in 1971.

Details of foreign trade in mineral commodities including total tonnage, principal destinations, and sources are given in tables 2 and 3.

The French Government asked Enterprise de Recherches et d'Activité Petrolières (ERAP), a wholly government-supported organization, to study the conditions under which the U.S.S.R. could participate in a joint refining venture in France. Elf was to define the type and location of the oil refinery and outline the contribution of all participants. Details of this study were not available at yearend. However, the study confirmed the determination of the French Government to diversify the source of its future oil supply.

Table 2.—France: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum:			
Bauxite	148,034	159,189	West Germany 90,182; United Kingdom 44,216; Italy 17,112.
Oxide and hydroxide [1]	286,529	263,809	Switzerland 108,861; Spain 62,104.
Metal including alloys:			
Scrap	14,819	24,104	Italy 17,368; West Germany 4,707.
Unwrought	179,808	147,013	Belgium-Luxembourg 49,430; West Germany 41,229; Italy 34,833.
Semimanufactures	85,959	101,987	West Germany 28,915; United States 14,822; Italy 9,024.
Antimony metal including scrap	194	118	United Kingdom 43; Belgium-Luxembourg 27; West Germany 22.
Arsenic (anhydride)	11,622	10,443	United States 2,452; United Kingdom 1,715; Belgium-Luxembourg 1,511.
Beryllium	2	1	All to United States.
Bismuth, all forms	72	82	Belgium-Luxembourg 51; Netherlands 7.
Cadmium	58	105	West Germany 62; United States 20.
Chromium:			
Chromite	230	203	West Germany 154.
Oxide and hydroxide	949	951	United States 175; Sweden 168; Belgium-Luxembourg 151.
Metal	343	321	Italy 74; West Germany 60; United States 46.
Cobalt	[r] 456	275	Switzerland 49; United States 40; West Germany 32.
Columbium ..... value, thousands [2]	[r] $4	$3	Mainly to West Germany.
Copper:			
Matte	911	701	Belgium-Luxembourg 356; West Germany 256; Spain 62.
Metal and alloys:			
Scrap	41,029	49,822	Belgium-Luxembourg 20,792; West Germany 12,835; Italy 11,681.
Blister and other unrefined	9,952	8,637	Belgium-Luxembourg 8,148.
Refined	[r] 8,296	6,018	West Germany 1,935; Italy 1,242; Netherlands 1,039.
Semimanufactures	[r] 38,003	52,043	West Germany 17,051; Netherlands 4,728; United States 4,463.
Gallium [3] ..... value, thousands [2]	$336	$614	Switzerland $603.
Germanium, all forms	1	42	All to Belgium-Luxembourg.
Gold: [4]			
Ashes and sweepings ... troy ounces	[r] 71	112	Switzerland 58.
Metal:			
For domestic use ..... do	[r] 63,948	138,859	Thailand 59,511; Netherlands 16,140.
Temporary imports ..... do	3,179,769	5,385,917	Muscat and Oman 2,014,724; Lebanon 649,155; United Kingdom 594,884.
Iron and steel:			
Iron ore ..... thousand tons	18,515	18,643	Belgium-Luxembourg 13,695; West Germany 4,948.
Pyrite cinder ..... do	183	219	Belgium-Luxembourg 118; West Germany 101.
Metal:			
Scrap ..... do	[r] 2,229	2,637	Italy 2,170.
Pig iron including spiegeleisen [5] ..... do	74	200	Italy 73; Belgium-Luxembourg 62; West Germany 58.
Ferroalloys ..... do	331	426	West Germany 106; Italy 94; United States 94.
Shot and powder ..... do	22	27	West Germany 10; Italy 8.
Steel:			
Primary forms including coils ..... do	704	1,067	Italy 350; Belgium-Luxembourg 229; West Germany 178.
Semimanufactures:			
Bars, rods, wire rods, and sections ..... do	[r] 2,431	2,596	West Germany 567; United States 492; Belgium-Luxembourg 264.
Plates, sheets, and universals ..... do	2,410	2,576	West Germany 748; Italy 287; United States 224.
Hoop and strip ..... do	209	217	West Germany 70; Italy 30; Netherlands 23.
Rails and accessories ..... do	201	252	Italy 73; Guinea 33; Iran 23.
Wire ..... do	113	105	West Germany 19; Algeria 9; Morocco 7.
Tubes, pipes, and fittings ..... do	[r] 823	951	United States 168; Netherlands 134; U.S.S.R. 62.
Castings and forgings, rough ..... do	20	27	Belgium-Luxembourg 11; United States 7.

See footnotes at end of table.

Table 2.—France: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS—Continued			
Lead:			
Ore	4,333	2,168	Belgium-Luxembourg 1,938.
Oxides	9,429	8,996	Netherlands 2,453; Czechoslovakia 1,316; Hungary 1,080.
Metal including alloys:			
Scrap	14,670	22,335	Italy 11,785; West Germany 10,120.
Pig iron including alloys	19,095	27,706	West Germany 8,598; Switzerland 4,761; Belgium-Luxembourg 4,063.
Semimanufactures including alloys	939	1,432	Algeria 408; Italy 370.
Magnesium, all forms	729	667	Greece 132; Cameroon 110; Netherlands 100.
Manganese:			
Ore	594	1,308	Netherlands 520; Argentina 150.
Oxide	521	445	NA.
Metal, all forms	6,476	6,325	West Germany 2,417; Italy 1,224; Sweden 953.
Mercury 76-pound flasks	[r]145	522	Belgium-Luxembourg 145.
Molybdenum:			
Ore	80	45	Italy 25; Netherlands 20.
Oxide	27	22	Sweden 11; Italy 5.
Metal, all forms	36	32	West Germany 21.
Nickel:			
Matte, speiss, etc	154	210	People's Republic of China 100; Italy 53; West Germany 47.
Oxide and hydroxide	[r]116	196	Italy 55; Netherlands 46; West Germany 30.
Metal including alloys:			
Scrap	1,640	1,686	West Germany 657; Netherlands 457; Belgium-Luxembourg 452.
Ingots	4,214	5,359	West Germany 1,132; People's Republic of China 995; Italy 810.
Semimanufactures including anodes	[r]2,996	3,549	West Germany 772; Spain 660; Italy 346.
Platinum and platinum group:[4]			
Ashes and sweepings troy ounces	1,093	1,100	Italy 354; Switzerland 116.
Metal including alloys do	127,992	757,567	United Kingdom 658,800; West Germany 30,061.
Selenium	2	41	West Germany 21; Netherlands 20.
Silver:			
Metal including alloys thousand troy ounces	6,640	6,515	Italy 1,785; West Germany 936; Netherlands 924.
Ashes and sweepings do	552	64	NA.
Sodium metal	1,440	--	
Tantalum, all forms value, thousands [2]	[r]$68	$124	West Germany $59.
Thorium oxide	1	19	Japan 16; West Germany 2.
Tin:			
Ore long tons	365	400	Mainly to Spain.
Oxide do	26	34	Mainly to West Germany.
Metal including alloys:			
Scrap do	14	29	Mainly to United Kingdom.
Ingots do	569	295	Italy 87; Switzerland 53; United Kingdom 50.
Semimanufactures do	[r]133	103	Belgium-Luxembourg 22.
Titanium:			
Ore	129	139	Algeria 65.
Oxide	9,844	14,569	United States 5,997; West Germany 1,887; Brazil 1,277; U.S.S.R. 1,064.
Metal, all forms	39	46	United States 15; Sweden 9.
Tungsten:			
Ore	--	125	West Germany 113.
Trioxide	169	147	Austria 128; West Germany 19.
Metal, all forms	301	246	West Germany 106; United Kingdom 62.
Zinc:			
Ore	7,126	4,819	Mainly to Italy.
Matte	324	1,462	Belgium-Luxembourg 1,255.
Oxide	8,887	24	Belgium-Luxembourg 21.
Metal including alloys:			
Scrap	2,155	1,610	Italy 1,152; West Germany 311.
Dust (blue powder)	2,352	1,966	Norway 800; Belgium-Luxembourg 461.
Slab and ingot	20,381	17,716	West Germany 10,329; Portugal 2,677.
Semimanufactures	[r]2,393	5,861	West Germany 4,139; Netherlands 640.
Zirconium:			
Ore	130	32	NA.
Oxide	75	101	Japan 45; West Germany 16.
Metal including nuclear grade	300	335	Sweden 216; United States 60.

See footnotes at end of table.

Table 2.—France: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS—Continued			
Other:			
Ore and concentrate	189	319	Algeria 103; Belgium-Luxembourg 55.
Ash and residues from nonferrous metals:			
Aluminum	5,114	6,961	Italy 5,164; West Germany 1,098; Spain 580.
Copper	3,222	4,171	Belgium-Luxembourg 2,370; West Germany 885; Spain 682.
Lead	8,626	7,890	Belgium-Luxembourg 7,113; Italy 327.
Nickel	476	746	West Germany 528; Italy 196.
Zinc	6,147	5,485	Belgium-Luxembourg 4,708; West Germany 604.
Other	33,237	35,940	Sweden 16,515; Belgium-Luxembourg 11,122; West Germany 6,101.
Slag and ash n.e.s	170,115	61,062	Belgium-Luxembourg 29,635; West Germany 26,342.
Metal including alloys, all forms [6]	328	272	West Germany 87; Belgium-Luxembourg 65; Turkey 25.
NONMETALS			
Abrasives, natural:			
Pumice, emery and other	622	535	NA.
Dust and powder of precious and semiprecious stones value, thousands [2]	$407	$189	Switzerland $76; Belgium-Luxembourg $52.
Grinding and polishing wheels	2,572	2,880	West Germany 633; Italy 428; Belgium-Luxembourg 404.
Asbestos, crude	794	201	NA.
Barite including witherite	14,415	19,052	Italy 4,723; Belgium-Luxembourg 2,822; Gabon 2,599.
Borates, natural	1,478	1,004	NA.
Bromine	2,005	--	
Cement thousand tons	1,006	1,317	West Germany 288; Ivory Coast 222.
Chalk	299,452	340,697	West Germany 143,826; Belgium-Luxembourg 69,183.
Clays and products:			
Crude:			
Kaolin	63,901	71,774	West Germany 40,308; Italy 13,368; Switzerland 6,151.
Bentonite	2,205	2,933	Belgium-Luxembourg 960; Tunisia 526; Iran 297.
Refractory	366,252	446,499	Italy 266,257; West Germany 95,678.
Other	[r] 1,406,949	90,914	Italy 37,103; Belgium-Luxembourg 25,164; West Germany 11,782.
Clay and refractory construction materials (bricks, tile, etc.)	208,003	246,949	West Germany 55,276; Belgium-Luxembourg 51,649; Greece 21,126.
Corundum:			
Natural including emery (included in abrasives above)	139	96	NA.
Artificial	13,942	16,642	West Germany 3,613; Belgium-Luxembourg 2,883; Italy 2,598.
Cryolite and chiolite, natural	1,513	1,478	Cameroon 757; Greece 720.
Diamond:			
Industrial excluding powder value, thousands [2]	$1,331	$1,305	West Germany $578; Ireland $196; Belgium-Luxembourg $139.
Gem unset do	[r] $10,338	$11,997	United States $5,485; Switzerland $3,955.
Diatomite	14,869	15,981	West Germany 8,866.
Feldspar	27,251	34,360	West Germany 12,300; Belgium-Luxembourg 11,272; Switzerland 5,300.
Fertilizer materials:			
Crude:			
Nitrogenous (natural sodium nitrates)	141	403	Mainly to Tunisia.
Phosphate rock	607	3,389	Thailand 1,000; Republic of Korea 1,000.
Potassic salts	59,503	61,325	Belgium-Luxembourg 30,525; Netherlands 21,047.
Organic	28,706	25,444	Italy 3,322; West Germany 1,872.
Manufactured:			
Ammonia, anhydrous thousand tons	52	186	West Germany 112; Spain 20.
Nitrogenous do	514	495	Arab Republic of Egypt 112; Belgium-Luxembourg 91.
Phosphatic:			
Basic slag do	280	329	Austria 148; Switzerland 122; Italy 56.
Other do	53	37	NA.
Potassic do	1,026	850	Belgium-Luxembourg 133; Italy 88; Ireland 68.

See footnotes at end of table.

Table 2.—France: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
NONMETALS—Continued			
Flint (pebbles)	96,783	110,142	West Germany 29,171; United States 25,581; Belgium-Luxembourg 14,589.
Fluorspar	102,226	146,456	West Germany 105,026; Italy 11,963; Belgium-Luxembourg 10,198.
Graphite	1,537	1,758	West Germany 304; Spain 297; Italy 273.
Gypsum and anhydrite including plasters	922,484	1,209,001	Belgium-Luxembourg 421,400; Sweden 282,187.
Iodine	35	11	Arab Republic of Egypt 5.
Lime	355,321	388,705	West Germany 198,096; Belgium-Luxembourg 150,522.
Magnesite including calcined	601	692	NA.
Mica	[r] 1,111	1,491	West Germany 742.
Pigments, mineral including iron oxide	2,954	2,574	Algeria 394; United Kingdom 324; Morocco 238.
Pozzolan, santorin, etc	2,870	3,273	Mainly to Switzerland.
Precious and semiprecious stones, except diamond [7] value, thousands [2]	[r] $12,117	$14,554	Switzerland $9,544.
Pyrite, gross weight	4	3	NA.
Salt	135,113	283,830	Netherlands 109,112; West Germany 80,983; Belgium-Luxembourg 33,990.
Sodium and potassium compounds n.e.s.:			
Caustic soda	279,561	278,417	Guinea 61,834; Australia 50,886; Brazil 20,248.
Caustic potash	[r] 9,216	10,372	Netherlands 3,165; United Kingdom 1,384; Switzerland 841.
Stone, sand and gravel:[8]			
Building stone:			
Crude and partly worked n.e.s	96,307	91,842	Belgium-Luxembourg 49,949; West Germany 15,845.
Worked:			
Slate including crude	19,983	22,789	Netherlands 10,500; Belgium-Luxembourg 8,188.
Not specified	[r] 6,486	8,936	West Germany 4,500; Belgium-Luxembourg 2,783.
Dolomite, chiefly refractory grade	91,369	67,061	Belgium-Luxembourg 28,382; West Germany 18,296; Switzerland 5,142.
Gravel and crushed stone thousand tons	[r] 10,241	10,833	West Germany 7,629; Switzerland 1,666.
Limestone (except dimension)	108,433	121,176	Belgium-Luxembourg 74,687; Switzerland 44,569.
Quartz and quartzite	904	2,519	NA.
Sand excluding metal bearing thousand tons	[r] 1,822	2,533	West Germany 996; Switzerland 577; Italy 499.
Sulfur, elemental do	868	1,142	United Kingdom 291; Netherlands 164; West Germany 78.
Talc and steatite	[r] 48,873	60,875	United Kingdom 13,553; West Germany 11,712; Belgium-Luxembourg 4,551.
Other:			
Nonmetals n.e.s	202,262	233,709	Switzerland 176,004; West Germany 45,744; Belgium-Luxembourg 10,331.
Slag, dross and similar waste, not metal bearing, from iron and steel manufacture thousand tons	808	1,095	West Germany 994; Belgium-Luxembourg 62.
Oxide and hydroxide of magnesium, strontium, and barium	[r] 9,227	11,074	U.S.S.R. 6,733; Belgium-Luxembourg 852; United Kingdom 714.
Fluorine	26	890	NA.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	16,182	14,863	Mainly to United Kingdom.
Carbon black	47,338	42,535	West Germany 9,653; Italy 8,576: Spain 6,178
Coal and briquets:			
Bituminous	1,102,001	1,214,001	West Germany 561,260; Belgium-Luxembourg 363,020; Italy 104,002.
Briquets of bituminous coal	43,022	95,433	Italy 37,626; West Germany 22,745; United Kingdom 20,459.
Lignite	17,276	25,813	Mainly to Spain.
Coke	887,991	1,110,001	West Germany 397,013; Belgium-Luxembourg 226,822; Algeria 40,738.
Gas including liquid petroleum gas	609,962	583,599	Spain 241,961; Portugal 119,704; United Kingdom 34,846.
Hydrogen, helium and rare gases	2,462	1,123	Spain 393; West Germany 324; Switzerland 174.
Peat including briquets	2,271	2,897	Mainly to West Germany.

See footnotes at end of table.

Table 2.—France: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
MINERAL FUELS AND RELATED MATERIALS —Continued			
Petroleum refinery products:			
Gasoline-thousand 42-gallon barrels	[r] 23,358	24,761	United Kingdom 10,829; West Germany 4,480; Netherlands 3,944.
Kerosine and jet fuel do	3,055	5,404	Switzerland 1,820; West Germany 1,337; United Kingdom 916.
Distillate fuel oil do	[r] 21,654	22,723	Switzerland 9,743; West Germany 8,706; Netherlands 2,328.
Residual fuel oil do	28,519	17,337	West Germany 5,295; United Kingdom 4,695; Belgium-Luxembourg 2,125.
Lubricants do	2,702	2,319	United Kingdom 366; Netherlands 305; Belgium-Luxembourg 266.
Other: bitumen, petroleum coke, and other residues do	[r] 2,084	2,551	West Germany 1,065; Switzerland 545.
Chemical derivatives of coal, petroleum or gas	[r] 45,184	60,511	Belgium-Luxembourg 24,096; Switzerland 14,788; West Germany 6,725.

[r] Revised. NA Not available.

[1] Excludes artificial corundum.

[2] Based on par value of franc effective on January 1, 1960 of 20.2550 U.S. cents equals 1 franc. The par value of the franc was changed on August 10, 1969 to 18.0044 U.S. cents equals 1 franc.

[3] Including indium and thallium.

[4] Calculated from quantities reported in kilograms.

[5] Including cast iron and shot, grit, powder, and sponge of iron or steel.

[6] Alkali, alkaline earth, and rare-earth metals except sodium.

[7] Including synthetic and reconstituted stone but not including diamond.

[8] Not including slate, flint, or industrial limestone.

Table 3.—France: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum:			
Bauxite	479,899	488,888	Australia 329,627; Greece 83,849 Guyana 43,794.
Oxide and hydroxide [1]	5,507	7,101	West Germany 3,784; United States 1,615; Canada 1,005.
Metal including alloys:			
Scrap	14,783	13,842	Belgium-Luxembourg 6,048; West Germany 2,416; United States 2,258.
Unwrought	142,275	183,338	United States 73,061; West Germany 17,805; Greece 1,246.
Semimanufactures	84,484	64,377	West Germany 30,703; Belgium-Luxembourg 18,390; Italy 6,227.
Antimony:			
Ore and concentrate	4,095	4,430	Republic of South Africa 1,354; Thailand 671.
Metal, all forms	996	389	Belgium-Luxembourg 254; Japan 36; Italy 33; People's Republic of China 26.
Arsenic, anhydride and acid	5	5	NA.
Beryllium metal, all forms value, thousands [2]	$420	$379	United States $311; United Kingdom $61.
Bismuth	842	917	Peru 293; Japan 118; United Kingdom 108.
Cadmium	749	606	Belgium-Luxembourg 212; Japan 85; Zaire 70.
Chromium:			
Ore	330,327	326,510	U.S.S.R. 124,802; Madagascar 89,757; Turkey 79,911.
Oxide and hydroxide	2,442	2,418	West Germany 1,759; United Kingdom 355; U.S.S.R. 159.
Metal	55	113	U.S.S.R. 40; West Germany 28; United Kingdom 27.
Cobalt:			
Ore	8,712	7,671	Morocco 7,329; Canada 292.
Oxide and hydroxide	136	290	Belgium-Luxembourg 263.
Metal, all forms	663	983	Belgium-Luxembourg 544; Zaire 141; Finland 121.
Columbium:			
Ore (including tantalum ore)	1,163	723	All from Canada.
Metal, all forms value, thousands [2]	[r] $121	$341	United States $284.
Copper:			
Matte	1,392	1,062	Belgium-Luxembourg 334; United States 144; Italy 133.

See footnotes at end of table.

Table 3.—France: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS—Continued			
Copper—Continued			
Metal including alloys:			
Scrap	13,147	12,234	West Germany 4,777; Belgium-Luxembourg 1,383; Switzerland 952.
Blister and other unrefined	15,844	16,469	Belgium-Luxembourg 9,625; Zaire 6,537; Zambia 235.
Refined	[r] 324,452	317,049	Belgium-Luxembourg 102,303; Zambia 66,190; Chile 51,322.
Semimanufactures	[r] 39,756	37,167	Belgium-Luxembourg 13,332; West Germany 13,094; United Kingdom 2,017.
Germanium, gallium, etc. value, thousands [2]	[r] $437	$426	Belgium-Luxembourg $311; Netherlands $62.
Gold: [3]			
Ashes and sweepings troy ounces	72,628	87,964	Netherlands 75,972; Switzerland 7,234.
Metal:			
For domestic use do	166,573	102,947	West Germany 86,678; United States 4,630.
Temporary imports do	3,871,137	5,367,431	United Kingdom 3,030,429; Switzerland 1,899,913; North Korea 290,514.
Iron and steel:			
Ore and concentrate, except roasted pyrite thousand tons	6,941	9,635	Brazil 2,195; Mauritania 1,951; Liberia 1,617.
Roasted pyrite do	32	59	Italy 28; Spain 27.
Metal:			
Scrap do	465	419	Belgium-Luxembourg 194; United Kingdom 90; United States 52.
Pig iron, spiegeleisen and other [4] do	249	153	West Germany 68; Belgium-Luxembourg 21.
Ferroalloys do	107	133	New Caledonia 91; Belgium-Luxembourg 20.
Steel, primary forms do	1,945	2,456	Belgium-Luxembourg 836; West Germany 644; United States 506.
Semimanufactures:			
Bars, rods, sections [5] do	1,832	2,104	West Germany 979; Belgium-Luxembourg 919; Italy 73.
Plates, sheets, and universals do	2,278	2,115	Belgium-Luxembourg 1,087; West Germany 636; Netherlands 82.
Hoop and strip do	349	364	Belgium-Luxembourg 240; West Germany 105.
Rails and accessories do	61	84	United Kingdom 66; Belgium-Luxembourg 14.
Wire do	104	102	West Germany 51; Belgium-Luxembourg 35.
Tubes, pipes, and fittings do	285	278	West Germany 130; Italy 38; Netherlands 19.
Castings and forgings, rough	7,057	9,735	West Germany 4,054; Belgium-Luxembourg 3,365; Switzerland 1,617.
Lead:			
Ore and concentrate	123,735	137,821	Morocco 48,632; Ireland 41,655; Australia 9,929.
Oxides	2,624	2,571	Belgium-Luxembourg 1,188; West Germany 736; Mexico 347.
Metal including alloys:			
Scrap	4,981	6,224	Belgium-Luxembourg 3,843; Algeria 850; Netherlands 471.
Unwrought	58,450	50,727	Morocco 18,010; Belgium-Luxembourg 14,077; United Kingdom 7,231.
Semimanufactures	463	505	Belgium-Luxembourg 322.
Magnesium including alloys:			
Scrap	46	2	NA.
Unwrought	1,183	2,775	Canada 836; United States 657; U.S.S.R 560.
Semimanufactures	94	123	Italy 70; United States 23; United Kingdom 18.
Manganese:			
Ore and concentrate	975,841	1,095,000	Gabon 484,808; U.S.S.R. 115,196; Brazil 96,531; Morocco 24,577.
Oxide	3,886	3,605	Japan 2,283; Belgium-Luxembourg 645; West Germany 470.
Metal, all forms	412	320	Republic of South Africa 235; United States 25.
Mercury, all forms 76-pound flasks	9,457	9,167	Spain 4,148; Mexico 1,886; Yugoslavia 1,334.

See footnotes at end of table.

Table 3.—France: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS—Continued			
Molybdenum:			
Ore and concentrate	7,705	9,431	Canada 4,247; United States 2,940; Netherlands 1,150.
Oxide	8	39	Netherlands 26; United States 12.
Metal, all forms	105	93	Austria 34; West Germany 30; United States 11.
Nickel:			
Matte	13,204	18,189	New Caledonia 12,664; Cuba 3,330; Canada 2,017.
Oxide and hydroxide	67	85	Canada 33; Italy 23; Netherlands 23.
Metal including alloys:			
Scrap	r 403	534	Belgium-Luxembourg 176; United States 104; Canada 74.
Unwrought	r 8,611	11,610	Canada 5,136; United Kingdom 2,133; U.S.S.R. 1,870.
Semimanufactures (including anodes)	2,657	4,296	United States 1,617; United Kingdom 1,147; West Germany 1,033.
Platinum and platinum group:			
Ashes and sweepings troy ounces	35,044	34,787	Netherlands 12,507; Spain 5,851; Algeria 3,376.
Metals do	413,715	217,917	United States 46,972; West Germany 42,793; United Kingdom 41,410.
Selenium	64	37	United States 20; Mexico 4.
Silver:[3]			
Ashes and sweepings thousand troy ounces	916	268	Netherlands 145; Spain 63; Switzerland 44.
Metal, all forms do	21,990	17,189	Switzerland 3,126; West Germany 2,337; United Kingdom 2,291.
Tantalum, all forms	17	18	United States 9; Belgium-Luxembourg 8.
Thorium:			
Ore (monazite)	554	2,441	Australia 1,829.
Metal value, thousands[2]	$1	$7	All from United States.
Tin:			
Oxide long tons	111	97	Belgium-Luxembourg 48; West Germany 46.
Metal including alloys:			
Scrap do	79	174	Italy 99; Switzerland 74.
Ingots do	11,140	9,871	Malaysia 2,922; Indonesia 1,803; People's Republic of China 1,768.
Semimanufactures do	34	52	West Germany 21; Belgium-Luxembourg 10; Netherlands 8.
Titanium:			
Ore	138,730	126,834	Australia 126,361; Ceylon 253.
Oxide	19,934	18,892	West Germany 10,495; Belgium-Luxembourg 3,311; Netherlands 2,390.
Metal, all forms	565	1,095	U.S.S.R. 441; Japan 262; United Kingdom 188.
Tungsten:			
Ore	2,746	2,675	United States 1,065; Brazil 810; Republic of Korea 219.
Trioxide	81	102	Mainly from West Germany.
Metal, all forms	66	145	West Germany 59; United States 24.
Uranium:			
Ore	1,193	1,467	All from Gabon.
Metal including alloys kilograms	r 40,446	266,878	Belgium-Luxembourg 156,042; Argentina 60,090.
Zinc:			
Ore and concentrate	412,477	411,147	Canada 126,507; Peru 90,907; Ireland 73,214; Sweden 34,731.
Oxide	3,021	3,657	West Germany 1,400; East Germany 1,070; Italy 447.
Metal including alloys:			
Scrap	18,439	17,428	Belgium-Luxembourg 8,545; Netherlands 5,279; West Germany 2,159.
Blue powder	4,366	4,458	Belgium-Luxembourg 4,191.
Unwrought	31,224	31,349	Belgium-Luxembourg 13,241; Bulgaria 4,746; Netherlands 4,523.
Semimanufactures	5,031	5,941	Belgium-Luxembourg 3,305; West Germany 1,295; Yugoslavia 1,020.
Zirconium:			
Ore	29,700	27,813	Australia 27,600.
Oxide	414	259	United Kingdom 109; United States 60; West Germany 55.
Metal	54	69	United States 63.
Other:			
Ashes and concentrates	28,971	82,152	New Caledonia 50,783; Iran 11,648; United States 8,032.

See footnotes at end of table.

Table 3.—France: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS—Continued			
Other—Continued			
Ashes and residues containing nonferrous metals:			
Aluminum	3,562	4,644	West Germany 2,346; Italy 1,375; Belgium-Luxembourg 786.
Copper	411	2,352	Belgium-Luxembourg 2,265; Switzerland 67.
Lead	86	64	NA.
Nickel	57	67	Netherlands 19.
Zinc	12,547	16,120	West Germany 7,581; Belgium-Luxembourg 3,519; Australia 777.
Other	32,230	50,498	Canada 48,995.
Metal including alloys, all forms	85	194	West Germany 140; Italy 25.
NONMETALS			
Abrasives:			
Emery, natural corundum, other	28,209	53,157	Turkey 49,897; Greece 3,258.
Pumice	19,959	23,198	Italy 20,584; Netherlands 539.
Dust and powder of precious and semiprecious stones value, thousands [2]	$4,791	$4,666	United States $1,791; United Kingdom $1,569; Switzerland $163.
Grinding and polishing wheels	5,821	6,445	West Germany 2,756; Belgium-Luxembourg 1,639; Italy 1,175.
Asbestos	135,137	151,846	Canada 73,526; U.S.S.R. 48,876; Italy 10,589.
Barite and witherite	79,349	87,414	West Germany 70,019; People's Republic of China 8,208; Romania 2,750.
Boron materials:			
Crude natural borates	107,591	117,367	Turkey 67,122; United States 48,070; Netherlands 2,143.
Oxide and acid	1,931	657	Italy 276; United States 236; Turkey 138.
Bromine value [2]	$405	$8,462	NA.
Cement	91,925	47,699	Switzerland 16,786; West Germany 14,796; Italy 14,324.
Chalk	3,620	4,066	Belgium-Luxembourg 3,131; West Germany 924.
Clays and products:			
Crude:			
Kaolin including calcined	286,274	317,594	United Kingdom 253,606; United States 40,716.
Bentonite	93,711	110,578	Italy 35,775; Greece 32,217; United States 20,249.
Refractory	196,220	182,380	West Germany 139,083; United Kingdom 23,910; United States 6,337.
Clay and refractory construction materials (bricks, etc.)	553,552	607,452	West Germany 224,377; Italy 137,145; Belgium-Luxembourg 122,210.
Cryolite and chiolite, natural	2,156	8,712	Belgium-Luxembourg 6,768; Denmark 1,944.
Diamond:			
Industrial except dust value, thousands [2]	$6,248	$6,139	Ireland $2,092; United Kingdom $1,610; Belgium-Luxembourg $1,328.
Gem unset do	$35,270	$31,041	Belgium-Luxembourg $10,234; Switzerland $5,289; Israel $4,485.
Diatomite	6,817	5,821	United States 2,630; West Germany 1,876; Denmark 599.
Feldspar	29,052	31,336	Norway 21,777; West Germany 3,870; Italy 1,545.
Fertilizer materials:			
Crude:			
Nitrogenous (natural sodium nitrate)	24,083	26,750	Mainly from Chile.
Phosphate rock thousand tons	3,523	3,637	Morocco 1,651; Togo 788; Tunisia 404.
Manufactured:			
Ammonia, anhydrous	173,647	127,901	Belgium-Luxembourg 117,707; West Germany 5,245; Netherlands 4,929.
Nitrogenous	349,363	434,883	Belgium-Luxembourg 219,501; Romania 106,836; West Germany 21,468.
Potassic	197,767	201,571	Belgium-Luxembourg 124,216; Israel 47,793; West Germany 17,886.
Phosphatic:			
Basic slag	942,463	876,721	Belgium-Luxembourg 690,208; West Germany 186,513.
Other	381,841	396,769	Netherlands 146,969; Tunisia 67,610; Belgium-Luxembourg 55,640.
Flint (pebbles)	486,548	448,437	United Kingdom 208,309.
Fluorspar	6,729	12,567	Tunisia 7,100; Mozambique 2,178; Republic of South Africa 1,172.

See footnotes at end of table.

Table 3.—France: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
NONMETALS—Continued			
Graphite	5,630	6,789	Malagasy Republic 3,500; Italy 1,248; West Germany 805.
Gypsum and plaster	10,815	4,133	West Germany 1,611; Italy 1,521; United States 718.
Iodine, crude	395	617	Japan 478; Chile 120.
Lime	175,616	183,613	Belgium-Luxembourg 133,951; West Germany 47,179.
Lithium and strontium minerals	3,899	5,565	Republic of South Africa 3,801.
Magnesite including calcined	48,710	56,587	Austria 24,142; United Kingdom 8,543; Greece 5,596.
Mica	4,909	4,967	Mozambique 1,240; West Indies 1,237; Norway 1,070.
Pigments:			
Earth pigments, including iron oxides	1,052	940	West Germany 339; Spain 252; Austria 210.
Earth, other (possolanic) santorin etc	367	87	NA.
Precious and semiprecious stones [6] value, thousands [2]	r $16,816	$17,002	India $6,832; Switzerland $4,486.
Pyrite	326,253	319,204	Cyprus 188,393; Spain 101,000; U.S.S.R. 29,155.
Salt	66,464	50,533	Algeria 23,500; West Germany 10,426; Netherlands 8,571.
Sodium and potassium salts n.e.s.:			
Caustic soda	38,246	60,894	Belgium-Luxembourg 41,152; Italy 8,788; Switzerland 8,034.
Caustic potash and peroxides of potassium and sodium	66	217	Sweden 64.
Stone, sand and gravel: [7]			
Dimension stone:			
Crude and partly worked:			
Slate	3,373	2,020	United Kingdom 857; Italy 830.
Other	218,860	202,535	Italy 82,611; Republic of South Africa 57,547; Norway 16,431.
Worked:			
Slate	48,059	33,939	Spain 28,932; Portugal 1,940; United Kingdom 1,871.
Other	97,443	91,206	Belgium-Luxembourg 72,973; Portugal 7,660.
Dolomite, chiefly refractory grade	187,728	167,411	Belgium-Luxembourg 146,277; West Germany 20,407.
Gravel, and crushed stone thousand tons	3,771	4,553	Belgium-Luxembourg 4,401; West Germany 82.
Limestone	172,481	155,770	Belgium-Luxembourg 147,587; West Germany 8,178.
Quartz and quartzite	34,893	36,344	Italy 15,450; West Germany 4,970; Portugal 3,890.
Sand excluding metal bearing thousand tons	1,822	1,628	Belgium-Luxembourg 658; Italy 460; Netherlands 258.
Sulfur, elemental, all grades	351,519	324,661	Poland 225,316; Canada 77,513; Mexico 11,908.
Talc and steatite	9,698	10,191	Italy 4,313; Belgium-Luxembourg 2,271; Austria 1,861.
Other nonmetals n.e.s	894,967	764,415	Switzerland 652,100; Greece 45,349; West Germany 23,492.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	1,599	2,624	United States 1,643.
Carbon black	60,649	69,075	Netherlands 28,175; United States 17,835; West Germany 11,175.
Coal and briquets:			
Coal thousand tons	12,517	14,189	West Germany 6,395; United States 3,450; Poland 1,544; U.S.S.R. 1,451.
Coal briquets do	261	207	Netherlands 134; Belgium-Luxembourg 52.
Lignite and lignite briquets do	309	299	Mainly from West Germany.
Coke do	3,290	2,858	West Germany 2,548.
Gas, hydrocarbon:			
Natural million cubic feet	77,996	93,805	Netherlands 78,431; Algeria 15,374.
Manufactured	69,718	49,342	West Germany 41,963; Belgium-Luxembourg 5,308.
Hydrogen and rare gases	4,415	6,681	West Germany 5,278; Belgium-Luxembourg 1,140.
Peat including briquets thousand tons	39	44	West Germany 26: Netherlands 11; Poland 6.
Petroleum:			
Crude thousand 42-gallon barrels	628,912	729,886	Algeria 196,284; Libya 128,394; Iraq 90,984.

See footnotes at end of table.

Table 3.—France: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Refinery products:			
Gasoline __thousand 42-gallon barrels__	[r] 8,636	12,147	Italy 5,049; West Germany 4,726; U.S.S.R. 697.
Kerosine_______________do____	430	772	West Germany 352; United Kingdom 193.
Distillate fuel oil_________do____	[r] 22,880	26,028	Italy 14,346; U.S.S.R. 5,655.
Residual fuel oil__________do____	4,423	2,880	U.S.S.R. 1,471; Italy 854; Belgium-Luxembourg 165.
Lubricants______________do____	280	272	United States 86; West Germany 80; Netherlands 38.
Other (vaseline, waxes, petroleum coke, bitumens, etc.)___do____	[r] 1,025	1,612	United States 887; West Germany 326.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals________	289,177	255,217	United States 147,411; West Germany 55,475.

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[r] Revised. NA Not available.

[1] Excludes artificial corundum.

[2] Based on par value of franc effective on January 1, 1960 of 20.2550 U.S. cents equals 1 franc. The par value of the franc was changed on August 10, 1969 to 18.0044 U.S. cents equals 1 franc.

[3] Calculated from quantities reported in kilograms.

[4] Includes cast iron and sponge, powder, etc. of iron and steel.

[5] Including wire rod.

[6] Including synthetic and reconstituted stone but not including diamond.

[7] Excludes flint and industrial limestone.

COMMODITY REVIEW

METALS

Aluminum and Bauxite.—Primary aluminum metal production rose to 384,000 tons in 1971, approximately 4,000 tons more than the 1970 output. Production of French secondary aluminum totaled a record 98,000 tons in 1971 compared with 87,000 in 1970. Aluminum scrap prices decreased steadily during 1971 and ingot prices following the trend declined approximately 30 percent. The pressure of foreign secondary ingots offered for sale on the French market continued throughout the year.

Bauxite ore production, averaging 55 percent aluminum oxide, increased to a record amount of 3.2 million tons in 1971.

Copper.—By the end of 1971, it was clear that France's last major overseas copper interest, Peñarroya's Disputada de las Condes Company, would come under the control of the Chilean Government. Peñarroya was to be paid compensation totaling $13 million in the form of deliveries of copper. Indications were that the Government was seeking to encourage the establishment of new vertically integrated French-controlled domestic copper operations which ultimately would meet at least one-third of France's requirements. To this end the Ministry for Industrial and Scientific Development was prepared to offer $80 million in aid.

Successful implementation of this program would thus support the work of GIRM, which maintains a copper stockpile for French industry normally of about 50,000 tons, equivalent to about a 2-month supply. GIRM's purchases from overseas producers were 240,000 tons in 1971. GIRM may also be given the job of managing a proposed stockpile of 10,000 tons of nickel.

Iron Ore.—French iron ore production in 1971 was 52.4 million tons from the Lorraine mines and 2.1 million tons from the Western, Pyrenées, and other mines, amounting to a total of 55.9 million tons compared with a total of 56.8 million tons in 1970. Because of a downturn in the activity of the iron and steel industry, iron ore imports decreased from 9.7 million tons to 8.7 million tons in 1971. A similar reduction was noted in iron ore exports which amounted to 18.6 million tons compared with 19.1 million tons in 1970.

Iron and Steel.—The worldwide steel recession was not felt as much by the French steel industry as by most of its competitors. Crude steel production dropped 3.8 percent to 22.9 million tons, which was slightly higher than the 1969 output.

Consumption actually increased by 3 percent over that of the previous year, but the figure was masked by a reduction in the large stock built up during 1970 by steel users who were obviously reluctant to place new orders while the economic climate was unfavorable. Paradoxically, in view of the worldwide recession, 1971 was a record year for French steel exports, which totaled nearly 7 million tons and enabled France to achieve its objective of a surplus of steel exports over imports. The surplus was 900,000 tons compared with a 400,000-ton deficit in 1969.

The good export performance was the result of increased American market demand at the beginning of the year, when a strike in the U.S. steel industry appeared imminent. After the conclusion of a new wage agreement in the U.S. industry and subsequent introduction of economic measures, including the 10-percent import surcharge, exports to the United States declined sharply. Loss of U.S. markets was only partially compensated for by exports to other markets. The drop in sales coupled with the sharp fall in prices at the end of 1970, when French producers were giving discounts to domestic clients on certain products to overcome Belgian and West German competition, resulted in heavy losses by the major steel companies.

Expansion Plan.—As early as 1966, a series of mergers, under the Economic and Social Development Fund (ESDF) plan, resulted in the creation of two main groups in the basic steel sector of France, Wendel-Sidelor in Lorraine and Usinor in the north. In 1970 restructuring of the special steels sector under the ESDF plan was completed, when Compagnie des Ateliers et Forges de la Loire and Société des Forges et Ateliers du Creusot merged with Creusot-Loire.

The reorganization of the industry allowed the planners to set ambitious targets in the sixth French economic plan. These targets aim for an annual 5-percent production increase and an increase in steel-producing capacity by 1975 to 35 million tons, sufficient to satisfy the internal demand and to produce a trading surplus.

Under the sixth economic plan, investments totaled about $4 million as compared with $2 million under the previous plan. The investments are concentrated in three major projects: (1) Construction by Socilor, a subsidiary of Wendel-Sidelor, of a new oxygen steel plant at Grandrange in Lorraine, which will expand the annual capacity of the parent company to 4 million tons; (2) doubling of the capacity of Usinor's main Dunkirk plant to 8 million tons by the end of 1975; and (3) construction of a fully integrated steel plant in the new industrial zone at Fos-Sur-Mer, near Marseille by Wendel-Sidelor. Annual production, due to begin in 1973, will be 3 million tons initially and will increase progressively to 7 million tons by the end of the decade. The estimated cost was $1.2 million and by yearend financing of Wendel-Sidelors move to Fos-sur-Mer was still under consideration.

Another project was Péchiney-Ugine Kuhlmann's special steel plant expansion at Fos-sur-Mer. Details of the project were not available at yearend.

Lead and Zinc.—French production of refined lead in 1971 was about 160,000 tons compared with 170,000 tons in 1970. The 5.6-percent reduction was due to an accumulated stockpile of refined metal since 1970 and to a slight reduction in lead consumption. On the other hand the production of lead concentrate in 1971 remained stable at 40,900 tons compared with 40,300 tons in 1970.

The output of zinc concentrate fell rather sharply to 27,000 tons compared with 33,000 tons in 1970. Several undeveloped lead-zinc ore bodies and prospects were studied during the year, and some exploration work was carried out at Saint Salvy in the Tarn area, where zinc mineralization predominates; Les Farges in Corrèze where a vein deposit of lead rich in silver was found; and Carbonne in Ariège which has a mixed lead-zinc ore body. The lead-zinc mine of La Croix de Pallières had to be closed in 1971 when rich ore was exhausted and operation on marginal ore was no longer economical.

Nickel.—The production of refined nickel of high purity in France decreased from 11,000 tons in 1970 to about 10,000 tons in 1971. The decrease was due to termination of a contract between France and Cuba for the oxide supply to which France had access for several years. However, ore mined in New Caledonia will continue to supply most of France's nickel demands in the future.

Tungsten.—Mining operations at the Salau tungsten deposits went into full scale in April 1971. The Salau deposit is owned and operated by the Société Minière d'Anglade in which Charter Consolidated, Ltd., of Great Britain and Anglo-American Corp. of the Republic of South Africa hold a 40-percent interest. Since April the flotation concentrator treated 33,000 tons of run-of-mine ore. The shipments were basically 30 percent WO_3 concentrate. The company planned expansion of the flotation circuit to process about 60,000 tons of run-of-mine ore per year.

NONMETALS

Fertilizer Materials.—The French company Rhône-Poulenc officially announced the merger of two subsidiaries, Péchiney-Saint-Gobain and Progil. The new company Rhône-Progil will have a consolidated sales volume of about $727 million, ranking it as the largest chemical producer in France and among the largest in Europe. The new firm will provide about half of all French production of chlorine, sulfuric acid, and sodium phosphate.

In December of 1971 the establishment of a new fertilizer company, La Generale des Engrais (LGE) was announced by Rhône-Poulenc and Péchiney-Ugine Kuhlmann. The new company will produce about 3.5 million tons of fertilizer products annually at nine plants in France and eight plants in Belgium. In addition LGE will have a holding in Zuid Chemi of the Netherlands.

French chemical production increased 8.3 percent by volume in 1971 compared with a 9-percent increase in 1970, according to the Union des Industries Chimiques (UCI). Mineral chemicals were up 18 percent in 1971 compared with 1970 production, when total phosphate fertilizers in terms of P_2O_5 content increased 12.9 percent, to 1,083,000 tons; nitrogenous fertilizers increased 11.7 percent, to 1.5 million tons; and composite fertilizers were up 11.7 percent, to 7.5 million tons. A substantial decrease of 41 percent occurred in calcium carbide production (228,000 tons) and output of carbon disulfide was down 2.6 percent, to 100,000 tons, compared with 1970 figures.

UCI indicated that purchases from foreign parent companies by subsidiaries in France were increasingly affecting the trade balance. West Germany, still top supplier and best customer, reduced its trade in both exports and imports. Italy trimmed its purchases substantially, whereas the United Kingdom maintained its import volume. Japan in 1970 was a good partner and the trade cover there was 145 percent; in 1971 the cover slumped to 92 percent as Japan trimmed purchases and raised its exports to France by 50 percent. Exports to the franc zone in 1971 were only 2 percent higher than in 1970, mainly because of the drop in purchases by Algeria.

Potash.—France's State-owned potash company, Mines Dominales de Potasse d'Alsace (MDPA), produced its accepted ceiling of about 1.8 million tons of potash in 1971. The matter of limited production, because of salt disposal, has plagued the industry for many years. MDPA was planning to engage a Netherland salt company to erect a salt extraction plant at the Rhine river, with a 1 million-ton capacity in order to reduce the pollution level. However, by yearend no decision was made on this project.

Pyrite.—Société des Mines et des Produits Chimiques de Salsique continued to operate the only pyrite mine in France and in 1971 production was 82,000 tons compared with 85,000 tons in 1970. The decline in production was principally due to exhaustion of the rich pyrite vein at the present mine. The exploration group of the company searched in the vicinity of the present mine for new ore bodies and examined old works and dumps of closed mines as well.

Sulfur.—Société Nationale des Pétroles d'Aquitaine (SNPA) in July 1971 began shipments of liquid sulfur to Teesside. SNPA, which produces some 1.8 million tons of sulfur annually from the gas deposits in southwest France, shipped sulfur from the port of Bayonne on the Bay of Gascogne. On arrival at Teesside, the sulfur was discharged at the Seal Sands terminal into two steam-heated tanks, each with a capacity of 7,500 tons.

SNPA shipped some 270,000 tons of sulfur to the United Kingdom last year, or approximately 25 percent of all sulfur exports of France. Of the total exports, amounting to about 1 million tons in 1971, some 316,000 tons were in liquid form.

MINERAL FUELS

The Energy Commission's report for France's sixth economic plan (1971–75) was finally adopted by the National Assembly in June 1971. The plan projects the energy pattern for the years 1971–75 and also examines the prospects and problems envisaged for this sector of the nation's economy beyond 1985. It also emphasizes the need for an intensive search to discover sources of oil, particularly outside of the Middle East and North Africa, as well as the need for greatly increased oil storage capacity and more rapid development of nuclear power at home.

The annual growth rate of total energy consumption is expected to average 5.5 percent during the period 1971–75 and then to decline marginally to an average of 4.7 to 5.2 percent between 1976–80 and to 4.2 to 4.7 percent over the first half of the 1980's. Taking the average of these hypothetical rates, the Commission forecasts that France's energy balance sheet will be approximately as follows:

Energy source[1]	1965	1970	1975	1980	1985
Electricity:					
Hydro	15.5	18.7	19	20	60
Nuclear	.5	1.7	6	19	50
Percent of total	(9.6)	(9.2)	(9)	(10.8)	(15.6)
Coal	69	57.5	40	30	25
Percent of total	(41.6)	(25.7)	(14)	(8.3)	(5.5)
Natural gas	8	14.1	25	35	45
Percent of total	(4.8)	(6.3)	(9)	(9.7)	(10)
Oil[2]	73	131.5	190	256	310
Percent of total	(44)	(58.8)	(68)	(71.2)	(68.9)
Total	166	223.5	280	360	490

[1] Million tons coal equivalent.

[2] This figure does not include nonenergy products for inland consumption, net exports, increased stocks, or military requirements.

Should these forecasts prove accurate, France's total energy demand would double over the 15-year period, and it is predicted that although oil will continue to provide the major share nuclear power and natural gas will account for a growing proportion of the energy supply.

On the 25th anniversary of France's nationalization of gas and electricity, President Pompidou pointed out that despite plans for an all-out nuclear effort, the use of fuel oil in electric powerplants still remains a big factor in the coming years. In 1971 fuel oil provided 26 percent of France's electricity compared with 20 percent in 1970, while the demand for hydroelectric power dropped from 40 perent to 36 percent during the year. In 1975 France's electricity, according to plan six, will be provided 44 percent by fuel oil, 29 percent by hydroelectric power, and over 8 percent by nuclear energy. To this end in March 1971, France decided to speed up its nuclear program and started building three new 850,000-kilowatt power stations. It is anticipated that, these stations will be ready to provide electricity by the end of 1972.

Coal.—Production of coal and lignite for 1971, as reported by the French coal industry, was 35.8 million tons while in 1970 it was 40.1 million tons. The decline of approximately 4.4 million tons reflects the plan six trend to reduce coal production to 25 million tons annually by 1975.

The decline in output is to be shared by each of the producing areas. The coal mines of Nord et Pas-de-Calais, the largest coal producing region in France, reported yields of 15 percent less in 1971 than in 1970. In earlier years approximately half of France's total coal output came from this region. The Lorraine coal basin, the second largest producing region in France, reported an output of 11.51 million tons, or about 32 percent of the total French output. The remaining French coal production, amounting to 6.94 million tons, came from six mines in the Centre-Midi region and small producers. Much of the coal industry's retrenchment was centered in the fields which are considered high-cost operations.

The Lorraine coalfield boasted the highest productivity figures for the entire industry at 8.387 tons per underground man-shift compared with Pas-de-Calais' 1.997 tons and the national average of 2.626 tons.

Continued reduction in mine personnel was reported in 1971. The coal industry's labor force numbered 92,530 workers of which 2,041 were engaged in the lignite sector. Underground employees were reported at 61,136 of which 59,964 were employed in the production of anthracite and bituminous coal. Since 1970, the number of workers leaving the industry amounted to 7,928 of which 5,848 had been employed underground.

Lignite production at 2.75 million tons, was down slightly from the 1970 level of 2.79 million tons. Virtually all of the lignite production was consumed in electric powerplants or by small consumers adjacent to the producing fields. Output per man-shift for the industry averaged 5.545 tons or slightly above 1970 level.

Customs data published by the Ministère des Finances et des Affaires Économiques indicates that the solid fuels trade was considerably less in 1971 than in preceding years.

France's solid fuel exports totaled 1.52 million tons in 1971 compared with 2.15 million tons in 1970. Most of France's exports were confined to the member countries of the European Economic Community (EEC) although some tonnage was shipped to the United Kingdom, Spain, Switzerland, and North African countries. Exports and imports of solid fuels, in thousand tons, in 1970–71 were as follows:

	Exports		Imports	
	1970	1971	1970	1971 [p]
Coal (anthracite, bituminous)	[1] 1,162	[1] 846	13,716	13,596
Coke	907	601	3,384	2,750
Patent fuel	80	72	199	146
Lignite briquets	--	--	301	253
Total	2,149	1,519	17,600	16,745

[p] Preliminary.
[1] Includes a small amount of lignite.

Source: Statistique Mensuelle (Paris). December 1970–71.

Imports of anthracite and bituminous coal, coke, and briquets made from coal and lignite amounted to 16.76 million tons in 1971, or 4 percent below the 1970 level. Coal, principally anthracite and bituminous, accounted for most of the imports with the 1971 volume amounting to 13.6 million tons, slightly less than the previous year's 13.72 million tons. Coke imports fell to 2.75 million tons from the 3.38 million tons of a year ago, while the combined total of coal and lignite briquets imports was reduced to 399,000 tons in 1971 from 500,000 tons in 1970.

The EEC provided the bulk of France's coal imports in 1971. West Germany, France's principal source of imported coal, supplied 5.80 million tons in 1971, some 300,000 tons less than in 1970. A gain of 95,000 tons fom Belgium and a decline of a like amount in receipts from the Netherlands completed the EEC supplied imports in 1971. Although sources of coal from non-EEC suppliers in 1971 were much the ssame as in the previous year, there were some variations in the volume of coal received from certain exporters. Poland and the Republic of South Africa, in particular, provided greater amounts of coal, while smaller quantities were purchased from the United States and the United Kingdom.

Coke and Coal Chemicals.—Production of coke and coal chemicals amounted to 16.3 million tons in 1971 compared with 18.2 million tons in 1970. With the 10-percent decrease in domestic coke and coal chemical production in 1971, France imported 2.892 million tons of these commodities, principally from West Germany, 2.36 million tons; the Netherlands, 208,000 tons; Belgium, 178,000 tons; and other countries, 46,000 tons. Exports of coal chemicals and coke decreased from 1.1 million tons in 1970 to 672,000 tons in 1971, reflecting a greater demand by the domestic iron and steel industry.

Production of coke and coal chemicals in France in 1970 and 1971 was as follows in thousand tons:

	1970	1971
Coke-oven coke:		
Plants annexed to collieries	8,790	7,387
Steel plants cokeries	5,360	5,120
Other coke	10	5
Total	14,160	12,512
Coal chemicals	4,065	3,738
Total	18,225	16,250

Source: Statistique Mensuelle (Paris). December 1970-71

Coking coal consumed was mostly from Nord Pas-de-Calais basin with some small amounts from the Lorraine coal basins.

Natural Gas.—France has a highly active and diversified program of research in energy production and distribution. The Commission on Energy Research for the sixth economic plan recommended a total expenditure of approximately $1.9 billion for energy research and development for the period 1971–75.

Table 4.—France: Salient statistics of the coal and lignite industry [1]

(Thousand metric tons unless otherwise specified)

	1970	1971 p
COAL (anthracite, bituminous)		
Production:		
Nord/Pas-de-Calais	16,987	14,520
Lorraine	12,788	11,512
Aquitaine	1,616	1,459
Auvergne	611	592
Blansy	1,798	1,726
Cévennes	1,337	1,299
Dauphine	620	569
Loire	1,564	1,298
Others	33	34
Total	37,354	33,009
Average number of days worked	269.4	261.4
Average daily output (tons)	149.0	137.7
Number of workers:		
Underground	65,702	59,964
Overall	98,248	90,489
Production per man-shift (tons):		
Underground	2.643	2.626
Overall	1.738	1.713
Stocks at yearend:		
Shipping ore	2,102	1,127
Low-grade	3,688	3,827
LIGNITE		
Production:		
Provence	1,550	1,560
Region Landaise	1,235	1,192
Number of days worked	269.4	243.5
Average daily output (tons)	11.0	11.3
Number of workers	2,210	2,041
Output per man-shift (tons)	5.059	5.545

p Preliminary.

[1] Source: Statistique Mensuelle (Paris). December 1971–71.

The sixth economic plan indicated that use of natural gas in France will reach 35,000 million cubic meters per year by 1975. Present estimates indicate that by 1975 supplies will be only about half that much. Because of this situation, Gas de France asked Electricité de France to convert its power station from gas to fuel oil in 1971.

The U.S.S.R. and France signed a 50-billion-cubic-meter natural gas agreement in mid-1971.[4] The contract, worth some $730 million, calls for annual delivery of 2.5 billion cubic meters of Soviet natural gas over a period of 20 years beginning in 1975. France will pay about $36.3 million yearly, according to the Finance Ministry, and in addition will deliver up to $236 million worth of pipeline and equipment to the U.S.S.R.

Petroleum.—Union des Chambres Syndicales de l'Industrie du Pétrole, in a study on French petroleum, reported that French crude import sources in 1971 were markedly different than in 1970 because of the extended French difficulties in Algeria with subsequent nationalization and the end of the obligation of international oil companies refining in France to buy Algerian crude.

Imports from the Middle East as a whole rose 39 percent. Saudi Arabia, which supplied 16.9 percent of the total 107 million tons imported, displaced Algeria as the leading source. The first cargo for France of Norwegian offshore Ekofisk crude oil was to be delivered at the beginning of 1972. Elf-ERAP has a 5.6-percent share in the Phillip-led Ekofisk group.

Exploration.—During 1971, five land rigs were engaged in wildcat drilling in France and one on a drill ship offshore. Four of the rigs were in the Aquitaine basin, one was in the Paris basin, and the drill ship was off the southern coast of France in the Mediterranean. No new discoveries were reported. A substantial amount of gas was reported in 1971 by SNAP Esso's Ucha development drill team in their gasfield in Aquitaine.

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[4] Chemical and Engineering News. V. 49, No. 31, Aug. 2, 1971, p. 11.

Geophysical work included the start of extensive seismic surveys off Corsica, in the Mediterranean and onshore, seismic work on the Elf-ERAP's Dax, and Luy de France and Commiges Gimone-Volvester permits.

The number of applications filed, during the year, to drill in the Mediterranean offshore was unprecedented. Among the applicants were the Elf-ERAP interests for the Grand Fonds permit in the Gulf of Lions and Esso's application for the Rhône Maritime.

Refinieries.—Domestic refining capacity in France at the beginning of 1971 was 116 million tons per year. According to preliminary estimates of France's sixth economic plan, a total refining capacity of 165 to 185 million tons per year will be required by the end of 1975, rising to a projected 220 to 250 million tons in 1980 and to 270 to 320 million tons in 1985.

Early information about company expansion plans indicated that the bulk of this new capacity, at least during 1970–75, will come from expansions of existing plants. Projects already announced and due for completion over the next few years include British Petroleum's expansion at the Levera plant, from 4.9 to 11 million tons per year, and Antar's expansion at Douges, from 4.6 to 8 million tons per year. Reportedly,[5] Shell also decided on a major expansion of its Berre refinery, almost doubling its capacity to some 14 million tons per year. French refinery capacities in million tons for the years 1965, 1969, and 1970, as well as location and ownership, were as follows:

	1965	1969	1970
North:			
Dunkerque (BP)	5.5	5.5	5.5
Valenciennes (Antar)	--	3.5	3.5
Le Havre/Basse—Seine:			
Gonfreville (CFR) [1]	10.6	14.3	14.3
Port-Jerome (Esso)	4.0	7.2	7.2
Petite-Couronne (Shell)	5 5	9.2	9.2
Gravenchon (Mobil)	3.6	3.6	3.6
Vernon (BP)	--	3.0	3.0
Ile de France (Paris):			
Grandpuits (ELF)	--	3.6	3.6
Gargenville (ELF)	--	3.6	3.6
Atlantic:			
Donges (Antar)	4.1	4.6	4.6
Vern-sur-Seine (Antar)	1.2	1.4	1.4
Pauillac (Shell)	.5	.5	4.5
Ambes (ELF)	1.8	2.0	2.0
Bordeaux (Esso)	2.4	2.8	2.8
Mediterranean:			
Frontignan (Mobil)	1.7	1.7	4.0
Le Mède (CFR)	6.4	10.2	10.2
Berre (Shell)	6.0	7.0	7.0
Lavera (BP)	4.4	4.4	4.9
Fos (Esso)	3.0	3.0	3.0
Alsace/Lorraine:			
Reichsett (CRR) [2]	3.7	3.7	3.7
Hevilisheim (SRS) [3]	3.9	4.4	4.4
Hauconcourt (SRL) [4]	--	--	4.0
Lyon:			
Feysin (ELF)	2.0	6.0	6.0
Total	70.3	105.2	116.0

[1] Compagnie Française de Raffinage (CFR).
[2] Compagnie Rhénane de Raffinage—Shell/Mobil/ELF.
[3] Société de la Raffinerie de Strasbourg—Antar /BP/CFR.
[4] Société de la Raffinerie de Lorraine—CFR/Esso/ELF.

During 1971, the first year of the sixth plan, only 4.4-million-tons-per-year of capacity was added but it was expected that during 1972 an approximate 21-million-tons-per-year capacity will come on stream. Those refineries expected to expand in 1973 are in the north near Dunkirk; in the Seine Valley, at Vernon, Petite-Couronne, and Grovenchon; in the Atlantic area, near Ambes and Brest; and in the Mediterranean area, near Frontignan, Fos, Feyzin, and Lyon.

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[5] Petroleum Press Service. January 1971, p. 27.

The capacity of Mobil's Frontignan refinery in southern France, which more than doubled in 1970, will be increased 50 percent in 1972. Cost of expansion was put at $8.4 million. The expanded facilities will go on stream in 1973 and will mainly make products for export to Mobil's affiliates outside of France.

Consumption of oil products rose 9.8 percent in 1971, which was much more than in most European countries. Gasoline sales increased by 8.3 percent, reaching 13.3 million tons. Heavy fuel oil sales rose 20.3 percent, to 25.4 million tons in 1971.

Storage and Transportation.—The first part of the new crude 24.4-inch oil pipeline with a capacity of 160,000 barrels per day, between Fos and Lyon, went on stream at the end of 1971. The second part of the same pipeline, between Lyon and Strasbourg, was a 40.8 inch line with a 940,000-barrel-per-day capacity and was expected to be finished by mid-1972. When the work is completed, the whole system, to be known as the South European pipeline, will have a capacity of 1.8 million barrels per day.

The capacity of the French tanker fleet, 84 ships totaling 7.4 million deadweight tons, was increased by 30 percent in 1971 when seven small vessels were replaced by nine new 250,000 tankers. It was reported that in 1972 four more tankers will be added to the fleet.

Despite record sales of heavy fuel oil on the home market and diversification of the French crude supply from Africa to the Middle East, France faced problems with surplus fuel oil. Since storage capacity was full, French refineries were forced to export fuel oil at low prices. As a result, authorities plan to expand the storage facilities, particularly those close to the ports. Heavy investment in tank farms and underground storage facilities continued and by yearend total storage capacity was nearly 36 million cubic meters.

Petrochemicals.—The French Government gave fiscal administrative approval for a project to build a pipeline linking major petrochemical complexes in the Lyon area with facilities near the Mediterranean Coast. Sopagil and Cie. will be responsible for the realization of this project. The pipeline will be 146 kilometers long and will transport 200,000 tons of ethylene annually from Saint Auban to Pont-de-Claix.

The Mineral Industry of Gabon

By Henry E. Stipp[1]

Gabon's mineral industry continued to progress, and output and value of major mineral commodities increased substantially. In 1971, production of mineral commodities was valued at an estimated $128 million[2] compared with output valued at $94.7 million in 1970. The mineral industry has become the leading sector of Gabon's economy, accounting for about 29 percent of the 1970 gross domestic product (GDP) estimated at $325 million.

The Government and the petroleum companies operating in Gabon signed a new tax convention in April 1971 that raised the Government's share of gross profits from 16 percent to about 35 percent. According to a Government decree being legislated at yearend the territorial waters of Gabon would be extended from the present 25-nautical-mile limit to 30 nautical miles. The extension was considered necessary because of the Government's decision to award petroleum concessions that extend well beyond Gabon's old territorial waters boundary.

The European Development Fund (FED) granted an additional credit of about $16.2 million to continue work on the Port of Owendo, located 9 miles from Libreville. Work had been suspended in August 1970 pending a study of silting of the harbor. The port, which will provide docking facilities for ships with 32-foot drafts, should be ready for use in late 1974. Total cost of the project will be about $28 million.

The Government of Gabon and a number of friendly countries and aid organizations reached an agreement on the total financing necessary for funding the Trans-Gabonese Railroad, and the methods that each agency will use to provide funds to build the railroad. Cost of the project was estimated at $129.5 million plus a supplemental expense of $32.4 million for construction of a timber port at Owendo and for roads servicing the railroad. The United States will donate more than $25 million to the project while the Gabonese Government will contribute about $36 million. The railroad will run from Owendo to Booué, central Gabon, a distance of 206 miles. Later the railroad will be extended to Bélinga, site of a 860-million-ton deposit of high-grade iron ore. Although Gabon has deposits of lead, zinc, copper, diamonds, and phosphate rock in the interior of the country, development has been hindered because of transportation difficulties.

Under Gabon's second 5-year plan (1971-75) passed by the National Assembly at yearend, the Government, in association with the United Nations Development Programme (UNDP), planned detailed mineral prospecting of the Koulamoutou-Franceville region and the northeastern part of the Woleu-Ntem region. The Government also planned to establish a Geological Survey organization, a summary mineral plan, and a geological study of recorded mineral indications. In addition the plan provided for incorporating the processing of local raw minerals into the economy by constructing a cement works and a battery manufacturing plant.

PRODUCTION AND TRADE

Production of crude petroleum, manganese ore, uranium, and petroleum products increased substantially in 1971 compared with output in 1970. Recovery of gold decreased 1.5 percent, owing to natural depletion of deposits. Statistics on production are shown in table 1.

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[1] Physical scientist, Division of Ferrous Metals.

[2] Where necessary, values have been converted from African Financial Community Francs (CFAF) to U.S. dollars at the rate of CFAF 278=US$1.00.

The export of mineral commodities has become relatively more important to Gabon in recent years. In 1970 exports were valued at $66.2 million as follows: Crude petroleum, $49.5 million; manganese ore, $12.0 million; uranium ore, $4.5 million; and gold, $194 thousand.

Mineral commodity imports in 1970 consisted mainly of iron and steel tubes and pipes valued at $4.4 million and cement valued at $1.2 million. Statistics on foreign trade of mineral commodities are shown in tables 2 and 3.

Table 1.—Gabon: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity[1]	1969	1970	1971[p]
Gas, natural:			
Gross production ---- million cubic feet --	900	1,900	10,594
Marketed production ---- do ----	847	762	1,059
Gold, mine output, metal content ---- troy ounces --	14,243	16,108	13,728
Manganese:			
Ore, 50–53 percent Mn, gross weight ---- thousand tons --	[r] 1,393	1,453	1,869
Battery and chemical grade pellets, 82–84 percent MnO_2, gross weight ---- do ----	15	24	37
Petroleum:			
Crude ---- thousand 42-gallon barrels --	36,421	39,292	41,911
Refinery products:			
Gasoline ---- do ----	1,036	1,218	1,329
Kerosine ---- do ----	738	881	810
Distillate fuel oil ---- do ----	1,333	1,386	2,087
Residual fuel oil ---- do ----	1,938	2,604	2,517
Other ---- do ----	39	52	61
Refinery fuel and losses ---- do ----	169	190	274
Total ---- do ----	5,253	6,331	7,078
Stone, limestone, crushed and broken ---- thousand tons --	[e] 1,300	NA	NA
Uranium oxide (U_3O_8) content of concentrate ----	[r] 486	377	506

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, a variety of crude construction materials such as clays, sand and gravel, and stone, was also produced, but output is not reported and available information is not adequate to make reliable estimates of output levels.

Table 2.—Gabon: Apparent exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
Chromite ----	--	5,158	All to France.
Coal briquets ----	15,460	--	
Copper metal including alloys:			
Scrap ----	92	54	All to France.
Unwrought, refined ----	--	24	All to Italy.
Manganese ore ----	808,501	1,049,913	France 484,808; United States 219,190; West Germany 148,035.
Metal-bearing metallurgical residues, not further specified ----	81	--	
Petroleum:			
Crude -- thousand 42-gallon barrels --	9,285	13,022	France 10,469; Netherlands 1,157; West Germany 1,135.
Refinery products, residual fuel oil ---- do ----	858	105	Belgium-Luxembourg 70; United Kingdom 35.
Uranium and thorium ores and concentrates -- value, thousands ----	$7,523	$7,903	All to France.

Source: Statistical Office of the United Nations. 1969 Supplement to the World Trade Annual. V. 3 (Africa), Walker and Company, New York, pp. 410–411; 1970 Supplement to the World Trade Annual. V. 3 (Africa), Walker and Company, New York, pp. 139–140.

Table 3.—Gabon: Apparent imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
Aluminum and alloys, all forms	81	130
Barite and witherite	4,087	2,599
Cement	45,099	37,143
Clay products, nonrefractory	583	1,408
Copper metal and alloys, all forms	40	41
Iron and steel semimanufactures	26,818	25,031
Petroleum refinery products:		
Residual fuel oil ... thousand 42-gallon barrels	38	--
Lubricants ... do	17	21
Other ... do	2	2
Sodium and potassium compounds, caustic soda	326	--
Stone, sand and gravel, dimension, worked	--	292
Other crude minerals	r 4,240	2,849

r Revised.

Source: Statistical Office of the United Nations. 1969 Supplement to the World Trade Annual. V. 3 (Africa), Walker and Company, New York, pp. 412–418; 1970 Supplement to the World Trade Annual. V. 3 (Africa), Walker and Company, New York, pp. 141–149.

COMMODITY REVIEW

METALS

Gold.—Production of gold by the Gabonese Mining Exploration and Exploitation Co. (SOGAREM) decreased steadily from the 42,760 troy ounces of 1964, owing to depletion of the deposits, especially those at Eteke and Lastourville. SOGAREM conducted mineral exploration for new workable deposits in 1971. Alluvial deposits at Migoto and Massina in the Eteke region were being considered for exploitation.

Iron Ore.—Société des Mines de Fer de Mékambo (SOMIFER) searched for a suitable site to build an ore port, which will be required when the Bélinga deposits are developed. The site will be located northwest of Libreville between Santa Clara Point and Cape Esterias, where it will be possible to achieve water depths of 66 feet. A wharf 5 miles long is planned in addition to areas for stockpiling ore. The port presently being constructed at Owendo cannot accommodate modern ore ships of 200,000 to 300,000 tons deadweight capacity. Reportedly the quantity of iron ore in the area between Batouala, Belinga, and Mékambo has been underestimated. Although 860 million tons of ore has been reported, a figure of 2 billion tons would be closer to reality according to some geological estimates.[3]

Manganese.—Although production of manganese ore reached a record high in 1971, increased exports were hindered by the ability to move ore and concentrate to the port at Pointe Noire, Congo (Brazzaville), over the aerial bucket cableway, the Compagnie Minière de l'Ogooue (COMILOG) railroad, and the Congo-Ocean Railroad. This evacuation system functioned at maximum capacity in 1971. COMILOG planned to spend about $5.8 million during the second 5-year plan of Gabon (1971–75) to improve capacity and performance of the system. COMILOG also planned to spend about $3.6 million to increase mine and mill production capacity. When the project is completed, COMILOG will be able to export 2 million tons of concentrate in 1972 and 2.3 million tons in 1974. Reserves of manganese ore in the Moanda deposit were estimated at 235 million tons of 35 percent manganese content or better.

Uranium.—Compagnie des Mines d'Uranium de Franceville (COMUF) produced uranium concentrate equivalent to about 545 tons of uranium metal from deposits in the Mounana region. Reserves of uranium ore at Mounana have been estimated at the equivalent of 10,400 tons of uranium metal. A deposit recently discovered at Oklo appears to contain ore equivalent of 5,000 tons of uranium metal. Another deposit at Boyindzi reportedly has the equivalent of 3,000 tons of metal. Recent studies have indicated extensions of the initial deposit and the possibility of discovering new reserves.[4] COMUF produces magnesium uranate at a concentration plant with an annual capacity of 135,000 tons of uranium ore containing 0.4 to 0.5 percent uranium metal. The concentrate is shipped to France for refining at Gueugnon. Total investment in mine, plant, and equipment at the beginning of 1971 was more than $19.4 million.

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[3] Le Moniteur Africain (Dakar). Five Hundred Sixty-One Kilometers Owendo to Belinga—More Than 30 Billion CFA Francs to Invest—Where Does the Trans-Gabonese Railway Project Stand? Jan. 6, 1972, p. 8.

[4] Joint Publications Research Service. Translations of Africa No. 1139, Mar. 31, 1972, p. 23.

NONMETALS

Dimension Stone.—Société Gabonaise de Marbrerie et Matériaux (SOGAMAR) was constructing a factory for working marble at Libreville. Production was scheduled to start with annual output of about 753,000 square feet of marble slabs and 323,000 square feet of granite slabs. Marble for the plant will be obtained from the Tchibanga quarries, 260 miles southeast of Libreville. Reserves of marble at Tchibanga were estimated at 10 million tons. SOGAMAR planned to invest about $3.6 million in the operation, which was expected to begin early in 1972.[5]

MINERAL FUELS

Petroleum.—The major development in the petroleum industry in 1971 was the successful wildcat well (Lucina Marine No. 1) drilled jointly by Shell Oil Co. of Gabon, Gulf Oil Co. of Gabon, and Société ELF des Pétroles d'Afrique Equatoriale (ELF)—Petroleum Company of Equatorial Africa (SPAFE) in offshore waters 19 miles south of Mayumba. The Lucina Marine No. 1 was drilled in 130 feet of water and found several oil and gas zones in sandstone between the 4,265-foot and 5,905-foot levels. The well tested 2,700 barrels per day at the 4,350-foot level. At the 4,590-foot level it tested 4 million cubic feet per day of gas and 250 barrels per day of oil. From 5,741 feet it tested 6 million cubic feet per day of gas. Production of crude petroleum in 1971 totaled 42 million barrels compared with 39.3 million barrels in 1970. ELF–SPAFE produced 33 million barrels, mainly from its Anguille field, while Shell, in association with ELF–SPAFE, produced 9 million barrels from the Gamba-Irvinga field.[6] The ELF–SPAFE Torpille field, located 31 miles south of Port Gentil and 16 miles from the coast, produced about 1.2 million barrels in 1971.

The new Grondin Marine field of ELF–SPAFE was expected to produce about 20,000 barrels per day in 1973. The discovery well was drilled in 130 feet of water about 50 miles south of Port Gentil. ELF–SPAFE reported a flow of 2,582 barrels per day through a ½-inch choke from the 7,415-foot to 7,675-foot levels.[7] Prospecting was continued in the area and ELF–SPAFE studied methods of constructing production and pipeline facilities prior to investing about $17.9 million in the field. In April, a new field was discovered 19 miles south of Mayumba near the border with the Congo. The field is in an area held 50 percent by Shell, 30 percent by Gulf Oil Co., and 20 percent by ELF-SPAFE. The discovery well tested 2,700 barrels per day crude oil and 6 million cubic feet per day of gas.

Gulf acquired 26,400 square miles of far offshore waters. Shell and Gabon Petroleum Co. obtained a 9,370-square-mile offshore waters. Shell and Gabon Petrotained the 740-square-mile Cama Marin block and Valmar Construction Corp. obtained the 780-square-mile Tassi Marin block. ELF–SPAFE also was awarded an exploration area offshore, from west of Port Gentil south to the Sette Cama area.

Proved reserves of crude oil were estimated at 750 million barrels. Proved reserves of recoverable natural gas were estimated at 500 billion cubic feet in 1968. Additional reserves have been found recently. Total drilling (development and exploratory) equaled that of 1970.

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[5] Afrique Industrie Informations (Paris). Sogamar Marble Complex to Produce 70,000 Square Meters. Dec. 1, 1971, p. 394.

[6] World Petroleum Report. Gabon. V. 18, 1972, pp. 69–70.

[7] The Oil and Gas Journal. Gabon Production Goal Proves Elusive. V. 70, No. 10, Mar. 6, 1972, p. 72.

The Mineral Industry of East Germany

By Joseph B. Huvos [1]

In 1971 East Germany ranked as the world's leading producer of lignite, with about one-third of the world's total, and ranked about fifth in the production of potash with about one-eighth of the world's total. A few other mineral commodities were also produced, but in less important quantities. They included salt, iron ore, bituminous coal, fluorspar, crude oil, and natural gas.

The trend continued to switch the East German chemical industry from its lignite base to a base of crude oil and natural gas.

East Germany's mineral processing industries continued to operate mainly on imported raw materials, most notably including bauxite, aluminum, iron and steel, phosphates, and crude oil.

During 1971, East German national income increased by 4.5 percent compared with 1970 figures. Total industrial production increased by 5.5 percent, to 173 billion East German marks (DM, east),[2] corresponding to a plan fulfillment of 101.6 percent. Industrial production will reach 220 billion DM, east, by 1975, if plan goals are fulfilled.

Output value increases in 1971 for the minerals and related industries were as follows:

Industry group	Growth, percent
Ore mining, metallurgy, and potash	7.0
Coal and energy	3.0
Chemical industry	5.6

Total East German investments for 1971 were 32.8 billion DM, east. In 1971, total investments in the centrally-managed industries increased by 4 percent. Within this group of industries, the energy industry recorded a 21-percent increase and the chemical industry a 6.6-percent growth.

PRODUCTION

Iron ore and phosphatic fertilizer production decreased; crude oil production was unchanged; and there were increases in production of copper, iron and steel, potash, nitrogenous fertilizers, and petroleum products.

Some of the more important new or modernized industrial units that were commissioned were metallurgical plants, foundries, chemical plants, thermal power generating stations, and natural gas pipelines.

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[1] Foreign mineral specialist, Division of Fossil Fuels.

[2] Values have not been converted from East German currency units (DM, east) to U.S. dollars owing to the wide variation between the official exchange rate (DM, east 2.22=US$1.00) and those actually used for some transactions.

Table 1.—East Germany: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity[1]	1969	1970	1971[p]
METALS			
Aluminum:			
Alumina	53,729	54,796	47,348
Metal, primary[e]	[r] 55,000	[r] 60,000	65,000
Cadmium metal, primary[e]	12	[r] 15	16
Copper:			
Mine output, metal content[e]	[r] 15,000	[r] 10,000	12,000
Metal:			
Smelter[e]	[r] 15,000	[r] 10,000	12,000
Refined[e]	40,000	40,000	40,000
Iron and steel:			
Iron ore[2] thousand tons	899	422	318
Pig iron (excluding ferroalloys) do	2,098	1,994	2,028
Crude steel do	4,824	5,053	5,350
Steel semimanufactures (rolled products only) do	3,182	3,407	3,551
Lead:			
Mine output, metal content[e]	10,000	[r] 10,000	10,000
Metal, refined including secondary[e]	25,000	[r] 25,000	25,000
Silver mine output, metal content[e] thousand troy ounces	4,800	4,800	5,000
Tin:			
Mine output, metal content[e] long tons	1,000	1,000	1,000
Metal, including secondary[e] do	1,200	1,200	1,200
Zinc:			
Mine output, metal content[e]	10,000	[r] 10,000	10,000
Metal including secondary	[r] 15,000	[r] 15,000	15,000
NONMETALS			
Barite[e]	30,000	30,000	30,000
Boron minerals, processed borax	3,756	4,211	3,911
Cement, hydraulic thousand tons	7,410	7,987	8,473
Fertilizer materials, manufactured:			
Nitrogenous, nitrogen content:			
Ammonium sulfate do	153	167	163
Calcium ammonium sulfate do	155	123	168
Unspecified do	83	105	57
Total do	391	395	388
Phosphatic, P_2O_5 content:			
Superphosphate do	193	206	207
Calcined phosphate do	127	134	122
Thomas slag do	13	14	13
Unspecified do	36	76	72
Total do	369	430	414
Potassic, marketable potash, K_2O equivalent do	2,346	2,419	2,426
Fluorspar[e] do	80	80	80
Gypsum and anhydrite:			
Crude[e] do	282	289	315
Calcined do	238	244	266
Lime and dead-burned dolomite	2,513	2,673	2,810
Pyrite:			
Gross weight[e] do	140	140	140
Sulfur content[e] do	58	58	58
Salt:			
Marine do	61	49	50
Rock do	1,911	2,131	2,171
Sand and gravel do	7,146	7,167	7,424
Stone, crushed do	8,439	9,391	10,281
Sulfur:			
Elemental do	110	109	100
Sulfuric acid do	1,104	1,099	1,076
MINERAL FUELS AND RELATED MATERIALS			
Coal:			
Anthracite and bituminous do	1,332	1,300	1,200
Brown and lignite do	254,553	260,582	262,814
Total do	255,885	261,882	264,014
Coke:			
From anthracite and bituminous coal do	2,391	2,572	2,316
From brown coal:			
High temperature do	1,100	1,308	1,759
Low temperature do	5,334	4,968	4,415
Total do	8,825	8,848	8,490
Fuel briquets (from brown coal) do	56,869	57,078	55,439

See footnotes at end of table.

Table 1.—East Germany: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity [1]	1969	1970	1971 [p]
MINERAL FUELS AND RELATED MATERIALS—Continued			
Gas:			
Manufactured ... million cubic feet	143,588	150,758	158,213
Natural [e] ... do	7,000	14,000	100,000
Petroleum:			
Crude [e] ... thousand 42-gallon barrels	[r] 440	[r] 440	440
Refinery products:			
Gasoline ... do	16,133	19,006	20,051
Kerosine, jet fuel and distillate fuel oil ... do	24,723	27,504	27,507
Residual fuel oil ... do	25,841	30,663	33,940
Lubricants ... do	2,366	2,464	2,421
Asphalt ... do	3,236	3,430	4,170
Total [3] ... do	72,299	83,067	88,089

[e] Estimate. [p] Preliminary. [r] Revised.

[1] In addition to the commodities listed, magnesium, nickel, peat, and additional varieties of crude nonmetallic construction materials are produced, but information is inadequate to make reliable estimates of output levels.

[2] Source indicates that data includes "roasted ore"; presumably roasted pyrite.

[3] Total of reported figures only; no estimates have been made for unreported products or for refinery fuel and losses.

TRADE

In 1971 total East German trade with member countries of the Council for Economic Mutual Assistance (CEMA) increased 6 percent compared with the 1970 total. Imports from the Soviet Union provided East Germany with 88 percent of its crude oil, 58 percent of its aluminum, 73 percent of its copper, 39 percent of its rolled stock, and 33 percent of its pig iron. Hungary and Yugoslavia provided bauxite.[3]

East Germany's limited mineral exports consisted mainly of brown coal briquets, potash, salt, and iron and steel semimanufactures. In 1971 exports of all goods to the Soviet Union increased 11 percent.

In 1970, total East German trade was 39,597 million valuta-marks.[4]

In 1970, East Germany's trade, according to country groups, was as follows, in million valuta-marks:

Countries	Value	
	Exports	Imports
Communist countries	14,221	14,119
Western countries and Japan	4,212	5,444
Other	807	794
Total	19,240	20,357

The intensive shipbuilding program at East German Baltic ports continued with the purpose of enabling the nation to transport a larger share of its trade in East German flag vessels.

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[3] Neues Deutschland (East Berlin). Jan. 14, 1972, p. 3.

[4] Valuta-marks are values converted from other currencies to East German marks at the official East German exchange rates. Valuta-marks 4.20 = US$1.00.

Table 2.—East Germany: Exports of selected mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum metal and alloys:			
Scrap [2]	1,581	2,327	Netherlands 1,859; Austria 468.
Unwrought [2]	8,760	3,941	Austria 1,858; United Kingdom 1,712; Sweden 263.
Semimanufactures [2]	295	--	
Copper and alloys:			
Scrap [2]	1,060	2,109	Netherlands 1,982; Sweden 86.
Unwrought and semimanufactures [2]	2,816	2,165	Netherlands 1,383; Belgium-Luxembourg 688.
Iron and steel:			
Pig iron and ferroalloys thousand tons	599	490	Japan 373; Sweden 46; Belgium-Luxembourg 32.
Scrap [2] ... do	123	40	Denmark 17; Austria 14; Sweden 9.
Steel, primary forms [2] ... do	20	46	Spain 24; Austria 13; Belgium-Luxembourg 5.
Steel semimanufactures [2] [3] [4] ... do	[r] 206	205	Poland 115; U.S.S.R. 49; Yugoslavia 18.

See footnotes at end of table.

Table 2.—East Germany: Exports of selected mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS—Continued			
Lead: [2]			
Oxides	1,099	1,536	Italy 753; Sweden 418.
Metal and alloys:			
Scrap	450	101	All to United Kingdom.
Unwrought and semimanufactures	3,605	1,459	Netherlands 1,154; Yugoslavia 200.
Magnesium and alloys, unwrought and semimanufactures	101	--	
Nickel and alloys, all forms	247	186	Sweden 104; Netherlands 82.
Tin and alloys, unwrought and semimanufactures [2] long tons	539	--	
Zinc: [2]			
Oxides	3,329	3,705	Italy 1,201; France 1,070; Norway 973.
Metal and alloys, unwrought and semimanufactures	546	1,821	Netherlands 1,003; United Kingdom 551; Switzerland 267.
Other, metal-bearing slag, ash and similar residues [2]	12,394	14,723	Austria 13,157; Netherlands 794; Belgium-Luxembourg 772.
NONMETALS			
Chalk	36,261	35,776	NA.
Clays and products:			
Kaolin, crude	64,535	85,222	NA.
Refractory clays and burnt slate [5]	6,789	5,062	All to Poland.
Products:			
Nonrefractory [2]	9,381	9,717	Belgium-Luxembourg 3,838; Denmark 2,767; Austria 1,265.
Refractory [2]	12,556	12,212	Belgium-Luxembourg 4,196; Sweden 3,647; Yugoslavia 3,564.
Cryolite [5]	40	220	All to Poland.
Diamond:			
Gem [2] value, thousands	$207	--	
Industrial [2] do	$637	--	
Feldspar and fluorspar [2] [5]	25,406	29,919	Poland 10,380; Austria 8,129; Yugoslavia 5,839.
Fertilizer materials:			
Potassic, crude and manufactured, K_2O equivalent	1,656	1,739	Czechoslovakia 434; United Kingdom 183; Hungary 104; Austria 75.
Gypsum, calcined	67,948	61,399	NA.
Pyrite, unroasted [2]	2,600	3,950	All to Italy.
Salt, rock thousand tons	752	838	Czechoslovakia 643; Finland 90; Sweden 77.
Sodium and potassium compounds, n.e.s.:			
Caustic soda [2]	6,404	14,476	Sweden 11,260; Denmark 2,511; Switzerland 705.
Caustic potash, sodium and potassium peroxides	2,256	2,850	Yugoslavia 1,988; Switzerland 717.
Stone, sand and gravel:			
Dimension stone [2]	1,029	923	Sweden 593; Norway 330.
Crushed thousand tons	151	169	NA.
Gravel do	14	15	NA.
Sand [2] do	18	18	All to Austria.
Sulfur:			
Elemental [2]	16,323	2,600	Do.
Sulfuric acid and monohydrate	14,069	10,209	NA.
Other:			
Crude nonmetals, n.e.s.[2]	24,994	18,604	Norway 6,428; Netherlands 6,224; Belgium-Luxembourg 5,952.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	8,490	8,600	NA.
Coal, brown coal briquets thousand tons	3,509	3,786	West Germany (including West Berlin) 1,545; Czechoslovakia 930; Austria 255.
Coke [2] do	33	43	Sweden 33; Austria 8.
Gas, natural or manufactured not specified million cubic feet	1,122	1,300	NA.
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	3,561	3,946	NA.
Distillate fuel oil do	3,713	3,648	NA.
Residual fuel oil do	879	1,365	NA.
Paraffin do	422	354	NA.
Montan wax do	153	158	NA.
Crude chemicals from coal, gas and oil distillation	4,974	7,528	Switzerland 4,717; France 1,475; Netherlands 806.

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[r] Revised. NA Not available.

[1] Because East Germany publishes only limited data on mineral commodity exports, this table has been compiled from a variety of sources. Entries appearing without a source footnote are from official East German trade returns.

[2] Statistical Office of the United Nations. 1969 and 1970 editions of Supplement to the World Trade Annual. V. I (East Europe), Walker and Co., New York, 1971 and 1972.

[3] Compiled in part from East German data reported for trading partner countries (total not reported). Data on Bulgaria, Poland, West Germany, and Romania are from this source.

[4] Official trade returns of the U.S.S.R.

[5] Official trade returns of Poland.

Table 3.—East Germany: Imports of selected mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum:			
Bauxite	[r] 242,700	255,700	Hungary 182,900; Yugoslavia 70,887.
Alumina, Al_2O_3 content	64,645	63,303	West Germany 38,500.
Metal and alloys:			
Unwrought [2] [3]	86,963	99,494	U.S.S.R. 93,800; Sweden 5,602.
Semimanufactures (rolled)	29,900	34,800	U.S.S.R. 21,300.
Cadmium metal and alloys, unwrought [2]	200	261	All from U.S.S.R.
Chromium, chromite, Cr_2O_3 content	31,891	41,700	Mainly from Turkey.
Copper:			
Ore and concentrate [3]	1,081	4,442	Austria 1,977; Sweden 1,633; Italy 832.
Metal and alloys:			
Scrap [3]	377	665	Switzerland 465; Canada 200.
Unwrought [2] [3]	2,198	2,143	U.S.S.R. 2,051.
Semimanufactures [3]	162	495	Yugoslavia 342; Austria 100.
Iron and steel:			
Iron ore, iron content thousand tons	1,320	1,490	Mainly from U.S.S.R.
Scrap do	218	224	All from U.S.S.R.
Pig iron do	635	748	Mainly from U.S.S.R.
Ferroalloys	5,251	17,300	NA.
Steel semimanufactures: [4]			
Rod thousand tons	955	575	NA.
Hot-rolled strip do	199	206	NA.
Light sheet do	204	84	NA.
Heavy sheet do	560	575	NA.
Lead, unwrought, unalloyed [2]	49,800	44,400	All from U.S.S.R.
Magnesium, unwrought, unalloyed [2]	2,500	3,202	Do.
Manganese ore:			
Metallurgical grade thousand tons	177	175	Do.
Battery and chemical grade [2] do	3	3	Do.
Mercury [3] 76-pound flasks	6,788	6,150	Italy 4,351; Spain 1,799.
Nickel metal, all forms [3]	127	66	Sweden 37; Belgium-Luxembourg 29.
Titanium oxide [3]	125	80	All from France.
Tungsten ore and concentrate [3]	697	736	United States 706; Spain 30.
Zinc, unwrought [2] [3]	42,705	38,552	U.S.S.R. 38,200; Spain 352.
Other:			
Ores and concentrates, of molybdenum, tantalum, titanium, vanadium and zirconium [3]	3,402	167	All from United States.
Metals and alloys, n.e.s.[3]	142	429	Belgium-Luxembourg 365; United States 39; United Kingdom 25.
NONMETALS			
Abrasives, natural:			
Dust and powder of precious and semiprecious stones, except diamond [3] value, thousands	$158	$140	Netherlands $118.
Grinding wheels and stones [3]	65	155	Sweden 129; Austria 22.
Asbestos	46,390	44,968	U.S.S.R. 43,100; Italy 1,868.
Boron minerals, crude [3]	12,300	--	
Cement, hydraulic [2] thousand tons	[r] 160	202	U.S.S.R. 198; Poland 4.
Clays and products:			
Kaolin, crude	28,717	34,906	Czechoslovakia 9,139.
Bentonite [5]	938	905	All from Poland.
Refractory clays and burnt slate [5]	4,636	2,559	Do.
Products:			
Nonrefractory [3]	386	--	
Refractory [3]	1,061	2,344	Yugoslavia 1,436; United Kingdom 329; Italy 329.
Diamond:			
Gem [3] value, thousands	$175	--	
Industrial [3] do	$1,081	$606	All from Belgium-Luxembourg.
Feldspar and fluorspar [3]	26,756	21,505	Norway 10,687; Yugoslavia 5,464; Sweden 1,740.
Fertilizer materials:			
Crude phosphate rock and apatite concentrates, P_2O_5 content thousand tons	445	488	Mainly from U.S.S.R.
Manufactured:			
Nitrogenous, N_2 content do	124	160	West Germany 111.
Phosphatic, P_2O_5 content do	47	24	West Germany 11.
Graphite	5,164	4,927	NA.
Magnesite, crude [3]	8,537	1,336	All from Yugoslavia.
Mica	1,238	1,165	India 302.
Precious and semiprecious stones, except diamond [3] value, thousands	$84	$225	United Kingdom $177; France $48.
Pyrite, sulfur content	108,478	106,582	NA.
Talc and related materials [3]	1,452	1,405	All from Austria.

See footnotes at end of table.

Table 3.—East Germany: Imports of selected mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	26,482	28,400	Romania 6,600.
Coal:			
Anthracite [2] thousand tons	99	100	All from U.S.S.R.
Bituminous do	6,750	8,192	U.S.S.R. 3,471; Poland 2,049; Czechoslovakia 1,065.
Coke do	2,777	3,128	U.S.S.R. 1,520; Czechoslovakia 800; Poland 684.
Gas, manufactured million cubic feet	4,994	5,640	NA.
Petroleum:			
Crude thousand 42-gallon barrels	68,149	75,955	U.S.S.R. 67,863; Arab Republic of Egypt 6,850.
Refinery products, gasoline [6] do	196	169	NA.
Crude chemicals from coal, gas and oil distillation [3]	5,562	161	All from Netherlands.

r Revised. NA Not available.

[1] Because East Germany publishes only limited data on mineral commodity imports, this table has been compiled from a variety of sources. Entries appearing without a source footnote are from official East German trade returns.

[2] Official trade returns of the U.S.S.R.

[3] Statistical Office of the United Nations. 1969 and 1970 editions of Supplement to the World Trade Annual. V. I (East Europe), Walker and Co., New York, 1971 and 1972.

[4] Partial figures only; several classes of steel semimanufactures are not reported in official East German sources.

[5] Official trade returns of Poland.

[6] Partial figure; data on other refinery products not reported.

COMMODITY REVIEW

METALS

Aluminum.—In 1971, East German aluminum production increased by an estimated 5,000 tons. East Germany imported the necessary raw materials. In 1970, 255,700 tons of bauxite were imported, mainly from Hungary and Yugoslavia, however 63,303 tons of alumina was from West Germany. About 134,294 tons of aluminum metal and semimanufactures were also imported in 1970 to satisfy domestic demand.

Copper.—East German copper mines are gradually being phased out due to the exhaustion of ore reserves, even though the estimated 1971 mine output was somewhat above that of 1970. Copper demand was an estimated 90,000 tons in 1971, of which the Soviet Union was reported to have supplied 45,000 tons.[5]

Iron and Steel.—In 1971, East Germany's iron and steel industry continued to expand, with only a slight increase in output of pig iron, while output of crude steel rose by 5.88 percent. East German iron ore production, in a state of rapid decline, satisfied only a small fraction of domestic demand, making increasing iron ore imports necessary. Substantial imports of scrap, pig iron, ferroalloys, and all types of steel semimanufactures were also necessary.

In 1971, there were several projects for plant construction and updating underway in East Germany. The Maxhütte steelworks, the equipment of which was antiquated, was due for modernization. Steam-driven cogging mills are to be converted to electric operation.[6]

At Kauschwitz, a centrifugal casting unit for pipes up to 200 millimeters in diameter was commissioned.[7]

East Germany's Industrie Import Anlagen, the state organization for industrial plant imports, has engaged the Heutley Co. of France to erect a new galvanizing line for the Bandstahlkombinat at Eisenhüttenstadt. Coil up to 1,500 millimeters wide and 2.25 millimeters thick is to be produced at a rate of 210,000 tons per year by 1972.[8]

Direct agreement between the East German and Czechoslovak iron and steel industry organizations was aimed at a closer cooperation for exchange of specialty steel alloys; specialization in seamless tube production; for supplying East Germany with steel sections, wire rod, and sheets; for supplying special rails to Czechoslovakia; and the exchange of know how.[9]

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[5] Mining Magazine (London). V. 126, No. 1, January 1972, p. 35.

[6] Metal Bulletin (London). No. 5630, Sept. 7, 1971, p. 36.

[7] Metal Bulletin (London). No. 5661, Dec. 24, 1971, p. 31.

[8] Metal Bulletin (London). No. 5657, Dec. 10, 1971, p. 33.

[9] Metal Bulletin (London). No. 5627, Aug. 24, 1971, p. 30.

East Germany will import 700,000 tons of Japanese steel in a 4-year period beginning in 1974. These imports were valued at $15 million in 1971 and $27 million in 1972. East Germany is expected to import 8 million tons of steel products by 1975.[10]

NONMETALS

Cement.—East German cement production is to increase according to plan targets at a steady pace helped by the entrance of new production units. By 1975, the last year of the current 1971–75 5-year plan, cement production is to reach 11.2 million tons per year. At Ruedersdorf, in central East Germany, test operations reportedly started on the No. 5 kiln line, which has a capacity of 300,000 tons of clinker per year.

At yearend, the first cement kiln line of a new cement works at Karsdorf near Halle started trial runs. When completed, four new kiln lines will produce 2.3 million tons of cement per year, raising East German production by about 25 percent. By then, the Karsdorf plant's capacity will be 4 million tons per year.[11]

Fertilizer Materials.—*Nitrogenous Fertilizers.*—Development of East Germany's nitrogen industry continued. Until 1969 the only ammonia units were at the Leuna plant of Leuna-Werke "Walter Ulbricht" and at the Piesteritz facilities of VEB Stickstoffwerk Piesteritz. Both were older, lignite-based plants. A third new ammonia plant was started in 1970 at Schwedt-am-Oder. According to the latest plans, the Piesteritz fertilizer complex which has no ammonia plant at present is to undergo a massive expansion. New facilities are to be built which will bring rated ammonia capacity to 738,000 tons of nitrogen per year and urea capacity to about 458,000 tons of nitrogen per year.[12] The M. W. Kellogg Co. process is to be used in the ammonia units constructed by Toyo Engineering Co., while the Czechoslovak concern Technoexport will erect the urea plants using the Stamicarbon N.V. process. The facilities are expected to be onstream by 1974, and are expected to partially replace other older East German units.

East Germany converts much of its ammonia into nitric acid and calcium ammonium nitrate. A 56-kilometer ammonia pipeline connects the Leuna petrochemical combine to the Bitterfeld area's industry plants.

Potassic Fertilizers.—East Germany was about the world's fifth largest producer of potash. East Germany reportedly has planned to expand its potash mining capacity, with both Czechoslovak and Polish assistance. Poland has supplied considerable amounts of mining equipment and technical assistance to the project at Zielitz, near Magdeburg in the Calvorde mining area. This project is due to start production in 1972 and will produce a potash equivalent up to 800,000 tons of K_2O. This will raise East Germany's output to about 3 million tons per year.

There are also other potash mining development projects in the Strassfurt-Bernberg area. New shafts were also planned for Kaiseroda, Hämbach, and Bad Salzungen.[13]

Sulfuric Acid.—During 1971 East Germany signed a contract with Poland for the purchase of a 200,000-ton-per-year sulfuric acid plant, worth $9 million, and due for commissioning in 1974.

MINERAL FUELS

It was reported that, in the foreseeable future, lignite will remain East Germany's most important source of energy, while only additional power needs will be met by natural gas, crude oil, and nuclear energy. In 1971, East Germany's total power output was 69,420 gigawatt hours, corresponding to an apparent average generating capacity of 8,000 megawatts. At the beginning of the year installed capacity was more than 12,000 megawatts. It is expected that by 1975, the last year of the current 1971-75 5-year plan, a new generating capacity of 5,900 to 6,400 megawatts will be put into operation, including a second nuclear power station under construction near Greifswald near the Baltic coast. By 1972 the Boxberg thermal powerplant will have a capacity of 1,050 megawatts, with 3,000 megawatts final capacity.

Coal and Lignite.—East Germany's bituminous coal reserves, estimated at 200 million tons, are not considered to be of commercial value. Only decreasing quantities are mined, mainly in the Erc (ore) Mountain Area. This made imports of almost 9 million tons necessary in 1971.

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[10] Japan Metal Bulletin (Tokyo). No. 3, Apr. 1, 1971.

[11] Neues Deutschland. V. 27, No. 47, Feb. 16, 1972, pp. 1–2.

[12] Nitrogen. No. 71, May–June 1971, pp. 16–20.

[13] Phosphorus and Potassium. No. 57, January–February 1972.

East Germany was the leading producer of lignite on a worldwide basis. Lignite production will remain around the present level of 255 to 257 million tons per year in the next few years according to the current 1971–75 5-year plan.[14]

Recent geological surveying uncovered 90 million tons of lignite under the Mulde River in the Halle district, near the Bitterfeld and Wolfen chemical combines and the Elbe powerplant. Work has started on diversion of a 12-kilometer stretch of the Mulde River and moving 16 million cubic meters of earth to make the lignite deposits accessible for mining by 1977.[15]

At present production levels, an estimated one billion cubic meters of overburden has to be moved each year and about 2,500 hectares of agricultural land are temporarily occupied. In 1970, 16,000 hectares of mined land was restored for agricultural and reforestation purposes.

It was reported that during the cold winter months increased regulation of energy use was necessary during peak periods in order to minimize power shortages.[16]

Petroleum and Natural Gas.—East Germany's small crude oil production did not change significantly according to presently available estimates.[17] In 1971, increased amounts of crude imports were necessary to satisfy East German demand. About 90 percent of the imports, or 10.2 million tons, originated in the Soviet Union and came by the "Friendship" pipeline. In 1972, Soviet imports are planned to increase by 14 percent, to 11.6 million tons.[18] For the current 1971–75 5-year plan, total Soviet crude imports are targeted at 64.5 million tons.

East Germany's refinery throughput, which was 10.4 million tons in 1970, will rise to 18 to 19 million tons in 1975, the end of the current 1971–75 5-year plan. Much of East German refinery capacity is located at the Schwedt petrochemical combine on the Polish border, where the terminal of the "Friendship" crude pipeline is located. Work is underway to double up the pipeline by the end of 1975.[19]

East Germany delivered petroleum refining equipment to the U.S.S.R. for the Chalov petroleum refinery at Orsk, in the Oremburg area. Capacity and value of the plant were not given.[20]

The East German petrochemical industry was expanded further during the year. The chemical industry, much of which is in petrochemicals, produced 16 percent of total industrial output value. This is to increase by 47 to 49 percent during the current 5-year plan. The petrochemical industry is concentrated mainly in the Halle, Leipzig, and Frankfurt districts. In the Halle district are the Leuna (Walter Ulbricht) works with 30,000 employees, the Buna works at Skopau, and the Lützkendorf oil refineries. The Bitterfeld Chemical combine is the third largest, after Leuna and Buna. In the Leipzig district is the Böhlen (Otto Grotewohl) combine for gasoline, diesel fuel, and tar, and the Espernharn plant for oils and fuels. Located in the Frankfurt district is the Schwedt refinery and petrochemical combines.[21]

East Germany's natural gas production was an estimated 600 million cubic meters (20 billion cubic feet) in 1971.[22] Until 1969 only a few small gasfields were known, located near Erfurt, Cottbus, and Rostock, with a combined output slightly over 100 million cubic meters per year. The discovery of the important Salzwedel gasfields in the Magdeburg district near the West German border made possible planning for a production of 5.4 billion cubic meters of natural gas for 1972 and 11.5 to 14 billion cubic meters for 1975.

A natural gas pipeline was completed at yearend from the Salzwedel fields to Senftenberg southeast of the country, where natural gas is blended with manufactured gas made from lignite.[23]

Construction of the "Northlight" U.S.S.R.-East German natural gas pipeline continued. The pipeline is to become operational in 1973 and is scheduled to transport 8.5 billion cubic meters during 1973 to 1975. One thousand kilometers of the line runs through Czechoslovakia and East Germany furnished the pipe and equipment for this section. The pipeline will supply natural gas also to Austria, Italy, and West Germany.[24]

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[14] Neues Deutschland. Apr. 4, 1972, p. 1.

[15] Informationen Über den West-Ost-Handel (Information on West-East Trade). October 1971, p. 20.

[16] Die Wirtschaft (The Economy). Oct. 20, 1971, p. 16.

[17] Petroleum Press Service (London). V. 39, No. 1, January 1972, p. 28.

[18] Neues Deutschland (East Germany). Jan. 21, 1972, p. 3.

[19] Petroleum Press Service (London). V. 38, No. 7, July 1971, p. 272.

[20] Schweriner Volkszeitung (Schwerin). No. 15, Jan. 16, 1972, p. 5.

[21] Berliner Zeitung. Sept. 3, 1971, p. 3.

[22] Petroleum Press Service (London). V. 39, No. 1, February 1972, p. 73.

[23] Petroleum Press Service (London). V. 39, No. 1, January 1972, pp. 28, 29; No. 2, February 1972, p. 73; and Presse Informationen. Nov. 18, 1971, p. 2.

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[24] Petrol si Gaze (Bucharest). V. 23, No. 1, January 1972, p. 64.

The Mineral Industry of The Federal Republic of Germany

By F. E. Brantley [1]

The West German economy, which boomed to record levels in 1968–69 and then began to decline in 1970, failed to improve in 1971, and market movements showed decided reversals during the second half of the year. Costs and price increases continued throughout the year, and several economic and monetary measures were announced by the Government in attempts to stabilize the economy.

A large influx of short-term funds during the first quarter resulted in official intervention to stem the flow, and the Bundesbank reduced its discount rate, effective April 1. Additional excess funds flowed into the country during April, reflecting speculative pressures and on May 5 the official exchange market was closed as official

Table 1.—Federal Republic of Germany: Employment and turnover in the mineral industry

	Average 1971 employment (thousand persons)	Turnover (million dollars)			
		1970 [1]		1971 [2]	
		Domestic	Foreign	Domestic	Foreign
MINES					
Iron	4	40	--	43	--
Nonferrous metals	3	27	1	32	3
Potash and salt	13	184	64	196	78
Other nonmetallic minerals	1	11	5	12	6
Coal	251	1,699	560	1,930	688
Lignite	23	245	15	284	14
Peat	4	31	5	38	7
Oil and gas	6	299	3	429	1
Total	305	2,536	653	2,964	797
QUARRIES					
Stone	26	400	5	504	6
Sand and gravel	15	314	15	395	18
Slate, clays, other	52	[r] 824	[r] 35	1,143	45
Cement	17	534	17	742	19
Refractories	16	196	52	216	72
Lime, gypsum, chalk	15	272	19	346	24
Limestone, sandstone	6	127	--	175	--
Pumice	7	140	2	197	2
Total	154	[r] 2,807	[r] 145	3,718	186
PROCESSING PLANTS					
Iron and steel	326	6,344	2,007	6,215	2,327
Nonferrous plants	90	2,124	476	2,237	475
Petroleum refineries	36	5,069	207	6,091	242
Coal chemicals	4	72	22	86	26
Total	456	13,609	2,712	14,629	3,070
Grand total	915	[r] 18,952	[r] 3,510	21,311	4,053

[r] Revised.
[1] Values have been converted from Deutsche Marks to U.S. dollars at the rate of DM3.66 =US$1.00.
[2] Values have been converted from Deutsche Marks to U.S. dollars at the rate of DM3.22 =US$1.00.

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[1] Physical scientist, Division of Ferrous Metals.

reserves reached almost $19 billion. The Government announced on May 9 that the exchange rates for its currency would not be maintained within the established margins. A revaluation of the Deutsche Mark (DM), after freeing the rate of exchange, helped accelerate the falling market trend. At the Smithsonian conference held December 18 in Washington, realignments of international exchange rates were made and West Germany agreed to an official revaluation of the DM to DM3.225 per US$1.00. This compared with the previous DM3.66 per US$1.00 which had been fixed since October 29, 1969.

The gross national product (GNP) for 1971 was estimated at $234.6 billion, equivalent to $3,817 per inhabitant. Total imports were valued at $37.1 billion and exports at $42.2 billion.

Wages continued to rise in industry, as did general costs. Warnings were given to the Government by steel industry spokesmen on the possible inability of domestic producers to compete with other steelmaking countries unless inflation were halted and economic policies changed.

Turnover values for the mineral industry compared with those of 1970 are shown in table 1. Coal dominated the mining scene while iron and steel and petroleum dominated the processing field.

More rigid pollution laws were being drafted, which would add to production costs for many industries, at both local and Federal Government levels. Experts expected the overall price of dealing with the pollution problem to be almost 1 percent of the GNP by 1975.

West Germany continued to seek sources for its scarcer minerals through investments in foreign companies and through exploration and feasibility study projects throughout the world. There was increased activity in the oil and nuclear energy sectors during the year.

PRODUCTION AND TRADE

The index of industrial production for all industries rose in 1971 to 159.7 or 1.6 percent above that of 1970. In the mineral industries, mining of iron ore continued to decline, and extraction of crude oil and natural gas continued to show a sharp upward trend. Increased aluminum smelting capacity placed in operation during the year resulted in a 17.8 percent increase in the index over that of 1970 for the light metals smelting industry; the iron and steel foundry index was up 4.2 percent.

Industry sector	Index of production (1962 = 100)		Change (percent)
	1970[r]	1971	
Mining	99.6	101.6	2.0
Coal	85.9	86.6	0.8
Metal ores:			
Iron	42.6	40.4	−5.2
Nonferrous	115.9	122.7	5.9
Potash and salt	145.1	144.4	−0.5
Crude oil and natural gas	231.5	259.8	12.2
Iron and steel	144.7	130.8	−9.6
Nonferrous metals	158.7	160.5	1.1
Stone and sand	135.2	143.2	5.9
Mineral oil products	219.4	221.1	0.7

[r] Revised.

Table 2.—Federal Republic of Germany: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971[p]
METALS			
Aluminum:			
Bauxite, gross weight	3,207	3,038	2,871
Alumina thousand tons	680	757	826
Metal:			
Primary do	263	309	428
Secondary:			
Unalloyed do	34	26	29
Alloyed do	237	232	247
Bismuth, smelter[e]	250	350	400
Cadmium, smelter	792	1,035	981
Cobalt, smelter	850	826	601
Copper:			
Mine output, metal content	[r] 1,587	1,477	1,484
Metal:			
Blister and anodes:			
Primary	[r] 92,800	84,400	82,646
Secondary	91,600	133,200	122,639
Refined, including secondary:			
Electrolytic	302,537	307,240	305,001
Fire, refined	99,595	98,600	95,051

See footnotes at end of table.

Table 2.—Federal Republic of Germany: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971 [p]
METALS—Continued			
Gold:			
Mine output, metal content troy ounces	[r] 2,842	1,952	1,704
Metal (including secondary) do	192,583	101,789	198,338
Iron and steel:			
Iron ore and concentrate thousand tons	6,060	5,531	5,020
Pig iron and blast furnace ferroalloys do	33,764	33,627	29,990
Electric furnace ferroalloys do	251	269	234
Steel ingots and castings do	45,316	45,041	40,313
Semimanufactures do	[r] 32,247	32,291	28,717
Lead:			
Mine output, metal content	[r] 41,709	40,952	41,339
Metal, unalloyed:			
Primary	125,808	112,500	98,400
Secondary	179,449	192,900	202,800
Magnesium metal and alloys:			
Unwrought (secondary only)	2,130	1,900	1,800
Castings	40,137	40,196	39,110
Mercury (secondary only) 76-pound flasks	1,944	1,973	2,002
Molybdenum metal	346	251	130
Nickel including secondary [1]	[r] 800	564	200
Platinum troy ounces	1,479	1,736	3,537
Silver:			
Mine output, metal content thousand troy ounces	[r] 1,730	1,814	1,871
Metal including secondary do	27,066	24,382	18,049
Tin metal (including secondary) long tons	2,381	2,165	2,297
Tungsten, metal	819	966	809
Zinc:			
Mine output, metal content	[r] 125,728	128,617	131,984
Metal, unwrought, unalloyed, primary	147,141	150,224	126,436
NONMETALS			
Barite	437,474	412,586	408,862
Bromine, fluorine, and iodine	3,626	3,991	4,196
Cement, hydraulic thousand tons	35,078	38,325	41,013
Chalk do	118	NA	192
Clays:			
Fire clay (exclusive of Klebsand) do	4,256	4,485	4,597
Kaolin (marketable) do	436	447	418
Bleaching do	566	612	614
Other (Schieferton) do	68	117	127
Corundum, artificial do	103	106	98
Diatomite and similar earths (marketable)	97,113	76,392	66,553
Feldspar (marketable)	361,279	408,809	353,693
Fertilizers:			
Crude, potassic:			
Gross weight thousand tons	20,310	21,030	22,306
K_2O equivalent do	2,626	2,645	2,815
Manufactured:			
Nitrogenous (nitrogen content):			
Nitrogen fertilizers do	1,172	1,143	964
Mixed fertilizers do	422	425	421
Total do	1,594	1,568	1,385
Phosphatic (P_2O_5 content):			
Superphosphate do	70	50	46
Thomas slag fertilizer do	302	313	347
Other phosphatic fertilizer do	110	117	133
Mixed fertilizers do	429	432	433
Total do	911	912	959
Potassic, K_2O equivalent:			
Marketable crude do	37	40	45
Chemically processed do	2,246	2,266	2,398
Total do	2,283	2,306	2,443
Content of mixed fertilizers [2] do	474	504	483
Mixed fertilizers, gross weight do	3,087	3,136	3,087
Fluorspar (marketable)	84,766	75,114	84,687
Graphite:			
Crude	19,598	18,346	15,700
Marketable	[3] 13,035	16,406	[3] 12,688
Gypsum (inclusive of anhydrite) thousand tons	1,826	2,061	2,534
Lime, quicklime and hydrated lime including dead-burned dolomite do	10,938	10,716	10,561
Pigments, natural mineral do	16	15	15
Pumice:			
Crude and washed do	7,149	7,054	7,914
Marketable do	4,001	4,214	5,020

See footnotes at end of table.

Table 2.—Federal Republic of Germany: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971[p]
NONMETALS—Continued			
Pyrite (marketable):			
Gross weight .... thousand tons	640	554	[e]554
Sulfur content .... do	266	242	[e]242
Quartz, quarzite, glass sand:			
Quartzite .... do	250	251	245
Quartz sand (ground) .... do	1,080	1,144	898
Quartz sand (unground) and glass sand .... do	5,586	5,682	5,569
Salt (marketable):			
Rock .... do	6,781	8,325	6,719
Marine and other .... do	2,078	2,122	2,201
Stone, sand and gravel, n.e.s.:			
Dimension stone .... thousand cubic meters	235	257	270
Limestone, industrial .... thousand tons	59,623	63,465	64,852
Crushed and broken .... do	105,819	117,612	120,793
Slate:[4]			
Roofing for office and industry .... do	28	23	18
Splittings and ground .... do	82	79	69
Basalt lava and lava sand .... do	7,634	8,379	7,593
Calcite .... do	22	15	11
Grinding and whetstone .... cubic meters	278	NA	NA
Printing stone .... thousand cubic meters	37	31	35
Tuff .... thousand tons	2	3	3
Industrial sands:			
Molding sand .... do	959	1,000	1,094
Other (Klebsand) .... do	163	172	149
Sand and gravel .... do	188,234	206,475	213,265
Sulfur, elemental, byproduct .... do	129	176	184
Talc including talc schist .... do	45	34	30
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	215,103	237,452	262,171
Coal:			
Anthracite .... thousand tons	10,607	10,216	9,920
Bituminous .... do	101,023	101,055	100,875
Pech .... do	763	671	68
Lignite .... do	[r]107,425	107,768	104,479
Total .... do	[r]219,818	219,710	215,342
Coke:			
Metallurgical .... do	39,011	39,914	37,537
Gas house .... do	2,406	2,565	2,014
Total .... do	41,417	42,479	39,551
Fuel briquets:			
Anthracite and bituminous .... do	3,907	3,725	2,716
Lignite .... do	10,499	9,571	7,758
Gas:			
Manufactured gas (excluding that from petroleum refineries):			
Blast furnace gas .... million cubic feet	517,993	518,134	445,492
Coke oven gas[5] .... do	641,806	644,807	606,597
Other gas .... do	275,524	259,279	233,464
Total .... do	1,435,323	1,422,220	1,485,553
Natural:			
Gross production .... do	314,722	446,987	542,614
Marketable production .... do	[r]306,555	440,152	535,029
Petroleum:			
Crude .... thousand 42-gallon barrels	56,886	54,427	53,597
Refinery products:			
Gasoline, aviation and motor .... do	99,396	110,843	112,824
Jet fuel .... do	10,281	9,196	11,955
Kerosine .... do	639	716	849
Distillate fuel oil .... do	252,006	276,722	301,225
Residual fuel oil .... do	173,304	221,749	186,564
Lubricants .... do	7,196	7,384	8,342
Liquefied petroleum gas .... do	22,693	29,477	23,621
Bitumen .... do	27,263	28,509	28,504
Other .... do	96,268	51,885	87,258
Refinery fuel and losses .... do	33,731	45,534	39,636
Total .... do	722,777	782,015	800,778

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[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] Primary nickel and nickel contained in ferronickel, monel metal and nickel oxide directly used by the steel industry.

[2] K_2O equivalent of potassic constituent not added to K_2O equivalent of marketable crude and chemically processed potassic fertilizers because this apparently would result in double counting.

[3] In part produced from imported crude graphite.

[4] Exclusive of slate recovered from mine dumps.

[5] Includes water gas and generator gas from coke ovens.

Table 3.—Federal Republic of Germany: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum:			
Bauxite	2,332	6,493	France 3,184; Austria 1,198; Switzerland 582.
Alumina	108,434	95,903	Austria 65,021; Republic of South Africa 13,411; France 2,919.
Aluminum hydroxide	59,205	75,808	Sweden 20,467; Netherlands 13,879; Belgium-Luxembourg 9,622.
Metal, including alloys:			
Scrap	6,757	12,058	Italy 5,943; Netherlands 3,533; France 2,206.
Unwrought	35,812	48,787	France 17,301; Italy 13,953; Belgium-Luxembourg 6,177.
Semimanufactures	150,337	136,037	France 30,200; Netherlands 19,945; Belgium-Luxembourg 16,110.
Antimony, metal including alloys, all forms	[r] 75	146	Netherlands 118; Romania 15.
Arsenic, hydroxides and acids	307	439	Philippines 150.
Beryllium metal, including alloys, all forms kilograms	175	146	NA.
Bismuth metal including alloys, all forms	113	236	Belgium-Luxembourg 79; Netherlands 75; Italy 28.
Cadmium metal including alloys, all forms	157	249	Netherlands 69; France 51; United States 40.
Chromium:			
Chromite	3,310	2,900	Austria 1,195; Belgium-Luxembourg 776; Yugoslavia 376.
Oxide and hydroxide	7,445	9,038	NA.
Metal including alloys, all forms kilograms	29,900	214,200	United States 146,800; France 27,000; Canada 13,600.
Cobalt metal including alloys, all forms do	198	197	United States 47; Japan 43; Netherlands 25.
Columbium and tantalum:			
Metal including alloys, all forms:			
Columbium do	1,828	1,521	France 290; Japan 170; Switzerland 38.
Tantalum do	23,175	62,134	Finland 16,979; United Kingdom 11,855; Belgium-Luxembourg 9,314.
Copper:			
Ore and concentrate	--	351	All to Belgium-Luxembourg.
Matte	--	3,024	Do.
Copper sulfate	1,017	1,530	Poland 487; Denmark 178; Netherlands 172.
Metal, including alloys:			
Scrap	30,940	35,265	Italy 13,906; Belgium-Luxembourg 7,211; Austria 5,987.
Unwrought:			
Blister	1,201	946	Spain 521; Belgium-Luxembourg 412.
Refined	95,471	79,944	Austria 16,009; United Kingdom 11,546; Switzerland 10,595.
Alloys	3,723	4,148	Switzerland 1,454; Italy 951; Belgium-Luxembourg 728.
Master alloys	573	360	Belgium-Luxembourg 234; Switzerland 49.
Semimanufactures	98,290	110,766	Netherlands 17,493; United States 17,308; France 11,818; Swtzerland 10,024.
Germanium metal including alloys all forms kilograms	1,900	600	United Kingdom 300; Netherlands 300.
Gold:			
Ashes, residue and scrap thousand troy ounces	3	14	NA.
Metal:			
Unwrought do	890	504	Switzerland 83; Italy 82; United States 45.
Semimanufactures do	4,037	6,623	Netherlands 2,529; Italy 1,489; France 1,092.
Iron and steel:			
Iron ore and concentrate	17,445	9,548	United Kingdom 2,698; Austria 1,640; Denmark 1,199.
Roasted pyrite	12,055	11,886	Austria 9,972; Belgium-Luxembourg 1,220.
Metal:			
Scrap thousand tons	[r] 1,872	2,295	Italy 1,817; Belgium-Luxembourg 295; Netherlands 43.
Pig iron, including cast iron do	976	881	Italy 354; Belgium-Luxembourg 106; Japan 76.

See footnotes at end of table.

Table 3.—Federal Republic of Germany: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS—Continued			
Iron and steel—Continued			
Metal—Continued			
Sponge iron, powder and shot thousand tons	14	17	Belgium-Luxembourg 3; Switzerland 3; Netherlands 3
Spiegeleisen do	11	16	Belgium-Luxembourg 13.
Ferroalloys:			
Ferrochrome do	26	32	United States 9; Belgium-Luxembourg 7; United Kingdom 5.
Ferromanganese do	45	39	France 9; United States 8; Italy 6.
Ferronickel do	117	56	Belgium-Luxembourg 40; Switzerland 5.
Ferrosilicon do	13	15	NA.
Ferrosilicochrome do	2	1	Mainly to Italy.
Ferrosilicomanganese do	1	2	Mainly to Malaysia and Romania.
Other do	6	8	Italy 1; Finland 1; United States 1; Belgium-Luxembourg 1.
Steel, primary forms do	[r] 2,069	1,707	France 643; United States 314; Italy 307.
Semimanufactures:			
Bars, rods, angles, shapes, and sections do	[r] 3,170	3,121	France 986; Netherlands 451; United States 333.
Universals, plates and sheets do	[r] 4,578	4,172	United States 719; France 632; Netherlands 340.
Hoop and strip do	[r] 654	614	Netherlands 130; France 103; Switzerland 63.
Rails and accessories do	139	123	Italy 31; Netherlands 26; United States 13.
Wire do	[r] 254	264	France 53; Netherlands 28; United States 24.
Tubes, pipes and fittings do	[r] 1,894	2,057	U.S.S.R. 510; Netherlands 357; United States 137.
Castings and forgings, rough do	[r] 44	54	Netherlands 10; Switzerland 7; Belgium-Luxembourg 7.
Lead:			
Ore and concentrate	7,598	1,884	Belgium-Luxembourg 1,879.
Oxides	8,235	7,237	Netherlands 2,505; France 740; Belgium-Luxembourg 734.
Metal, including alloys:			
Scrap	7,628	15,524	Italy 7,632; Belgium-Luxembourg 4,744; Netherlands 2,493.
Unwrought	39,455	52,627	Italy 26,157; France 4,935; Belgium-Luxembourg 4,381.
Semimanufactures	[r] 7,269	5,837	Sweden 976; Switzerland 798; Denmark 659.
Magnesium:			
Oxides, hydroxides and peroxides	[r] 2,652	2,615	Italy 538; Austria 403; Poland 348.
Metal, including alloys:			
Scrap	[r] 2,176	1,558	Italy 636; United Kingdom 342; Norway 201.
Unwrought	69	120	Switzerland 56; France 35.
Semimanufactures	207	240	Sweden 43; Spain 41; Italy 29.
Manganese:			
Ore and concentrates	[r] 4,422	402	Austria 160.
Oxides	1,382	2,257	NA.
Metal	70	141	Italy 42; United Kingdom 25; Netherlands 22.
Mercury 76-pound flasks	513	998	Switzerland 261; Arab Republic of Egypt 220; Netherlands 162.
Moybdenum:			
Ore and concentrates	106	265	Italy 99; Czechoslovakia 51; Netherlands 38.
Metal including alloys, all forms	167	262	Japan 94; Netherlands 33; France 31.
Nickel:			
Matte and speiss	27	10	All to Switzerland.
Metal including alloys:			
Scrap	1,985	1,033	Netherlands 449; United Kingdom 216; Sweden 112.
Unwrought	756	1,887	United States 497; Netherlands 438; France 279.
Semimanufactures	[r] 7,761	8,135	Netherlands 1,465; Switzerland 755; France 695; Italy 685.
Platinum-group metals and silver:			
Waste and sweepings kilograms	12,759	8,865	Belgium-Luxembourg 8,740.
Metals, including alloys, all forms:			
Platinum group thousand troy ounces	425	362	Italy 63; Hong Kong 43; Japan 42.
Silver do	[r] 47,155	32,802	Italy 10,269; Sweden 2,894; Switzerland 2,866; France 2,551.

See footnotes at end of table.

Table 3.—Federal Republic of Germany: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS—Continued			
Thorium, uranium and rare-earth compounds	364	142	United States 93; France 14; Belgium-Luxembourg 13.
Tin:			
Ore and concentrates long tons	56	24	All to United Kingdom.
Oxides do	174	246	France 36; Brazil 33; Italy 32.
Metal including alloys:			
Scrap do	81	199	United Kingdom 138; Netherlands 32.
Unwrought do	1,490	863	France 508; United Kingdom 54.
Semimanufactures do	[r]260	393	Netherlands 81; Switzerland 39; Italy 35.
Titanium:			
Ore and concentrate	528	147	Switzerland 83; Austria 56.
Oxides	43,318	41,916	Italy 6,137; France 4,030; Belgium-Luxembourg 3,820.
Metal including alloys, all forms	626	915	United Kingdom 230; Sweden 198; Italy 164.
Tungsten:			
Ore and concentrate	206	208	United Kingdom 159; Japan 25; Sweden 15.
Metal including alloys, all forms	319	502	Sweden 80; Switzerland 77; Belgium-Luxembourg 66; Japan 66.
Uranium and thorium metal, including alloys, all forms kilograms	1,300	12,500	France 9,100; Belgium-Luxembourg 2,200.
Vanadium metal including alloys, all forms do	300	400	United States 300.
Zinc:			
Ore and concentrate	60,327	49,852	Belgium-Luxembourg 30,201; France 12,228; Netherlands 6,623.
Oxide and peroxide	9,353	10,005	Denmark 1,580; Netherlands 1,054; Turkey 1,009.
Metal including alloys:			
Scrap	5,705	5,904	France 1,920; Italy 1,598; Netherlands 1,232.
Dust	3,470	3,840	Netherlands 1,788; Belgium-Luxembourg 944; Switzerland 696.
Unwrought	[r]35,506	54,125	Italy 20,645; United States 10,108; Switzerland 8,194.
Semimanufactures	[r]8,019	8,019	France 1,285; Netherlands 1,192; Sweden 933.
Zirconium metal including alloys, all forms	67	16	Sweden 12.
Other:			
Ore and concentrate:			
Of columbium, tantalum, vanadium, and zirconium	1,815	1,609	Austria 320; Italy 247; Switzerland 168.
Ash and residue containing nonferrous metals	157,322	175,411	Belgium-Luxembourg 70,777; Netherlands 57,975; Sweden 16,879.
Oxides, hydroxides and peroxides of metals, n.e.s	5,663	7,122	France 1,155; Italy 508; Austria 874.
Metals, including alloys, all forms:			
Metalloids:			
Arsenic and tellurium	7	10	Yugoslavia 5.
Selenium and phosphorus	11,826	16,067	NA.
Silicon	259	243	Italy 45; Republic of South Africa 41; Netherlands 34.
Alkali alkaline earth and rare-earth metals	7,075	8,587	NA.
Pyrophoric alloys	167	103	NA.
Base metals including alloys, all forms, n.e.s	598	1,140	France 313; United States 211; Sweden 192.
NONMETALS			
Abrasives:			
Natural:			
Pumice, emery, and corundum	544,317	559,933	Netherlands 346,215; Belgium-Luxembourg 185,852.
Dust and powder of precious and semiprecious stones thousand carats	166	165	Netherlands 86; United States 21; Switzerland 18.
Grinding and polishing wheels and stones	9,993	10,052	France 1,416; Netherlands 1,080; Italy 1,012; Switzerland 781.
Artificial:			
Corundum	35,716	37,321	Sweden 5,805; Italy 4,248; Austria 3,559.
Silicon carbide	7,479	8,609	NA.
Asbestos	703	925	Austria 434; Yugoslavia 75; Belgium-Luxembourg 75.

See footnotes at end of table.

Table 3.—Federal Republic of Germany: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
NONMETALS—Continued			
Barite and witherite	117,405	111,687	France 71,675; Netherlands 22,241; Austria 3,212.
Boron materials:			
Crude natural borates	4,313	9,827	Italy 4,324; Sweden 2,432; Belgium-Luxembourg 2,085.
Oxide and acid	151	350	Italy 209; Yugoslavia 57.
Bromine	68	20	NA.
Cement thousand tons	1,649	1,524	Netherlands 1,219; Nigeria 34; Belgium-Luxembourg 27.
Chalk	7,243	10,168	Netherlands 4,752; Denmark 3,070; Switzerland 1,420.
Clays and products (including all refractory brick):			
Crude n.e.s.:			
Fire clay thousand tons	383	349	Italy 78; Netherlands 67; France 58.
Kaolin do	91	98	Italy 31; Austria 21; Belgium-Luxembourg 14.
Kyanite, sillimanite, andalusite, mullite do	1	1	Mainly to Poland.
Other do	763	908	Netherland 432; Belgium-Luxembourg 163; Italy 155.
Products:			
Refractory (including nonclay bricks) do	r 405	443	France 100; Belgium-Luxembourg 80; Italy 49.
Nonrefractory do	478	474	France 131; Netherlands 104; Belgium-Luxembourg 74.
Cryolite and chiolite	--	10	NA.
Diamond:			
Gem:			
Crude or rough cut thousand carats	45	40	NA.
Other do	80	60	Belgium-Luxembourg 25; Netherlands 15.
Industrial do	90	100	Netherlands 45; Belgium-Luxembourg 15.
Diatomite and other infusorial earths	5,889	4,770	United Kingdom 1,008; Italy 695; Netherlands 635.
Feldspar, leucite, nepheline and nepheline syenite	14,981	14,287	Belgium-Luxembourg 3,166; Italy 2,560; France 1,955.
Fertilizer materials:			
Crude:			
Phosphatic	2,458	4,658	Switzerland 2,318; Netherlands 2,212.
Potassic	48,308	48,176	Netherlands 20,785; Belgium-Luxembourg 20,559.
Manufactured:			
Nitrogenous thousand tons	1,553	1,261	People's Republic of China 241; Brazil 202; Belgium-Luxembourg 154.
Phosphatic:			
Thomas slag do	230	275	France 208; Austria 24; Netherlands 15.
Other do	r 18	11	Denmark 3; Chile 2; Brazil 1.
Potassic do	1,782	1,783	Belgium-Luxembourg 291; Netherlands 188; Denmark 177; Brazil 136.
Mixed do	r 894	699	Cuba 137; France 95; Denmark 48; Turkey 32.
Ammonia, anhydrous do	80	15	France 4; Austria 3; Denmark 2.
Fluorspar	9,956	7,988	Belgium-Luxembourg 2,476; Austria 1,635; Czechoslovakia 1,615.
Graphite, natural	r 7,581	9,321	Italy 2,565; United States 2,132; United Kingdom 632.
Gypsum and plasters	313,998	258,992	Netherlands 91,803; Belgium-Luxembourg 60,116; Switzerland 42,243.
Iodine	9	26	Switzerland 11; France 3.
Lime	r 527,008	549,914	Netherlands 448,315; Belgium-Luxembourg 43,240; France 40,574.
Lithium minerals	81	212	Belgium-Luxembourg 106.
Magnesite	12,057	9,017	France 5,367; Belgium-Luxembourg 1,127; Netherlands 879.
Mica:			
Crude including splittings and waste	r 908	838	Switzerland 304; Sweden 122; Austria 91.
Worked including agglomerated splittings	r 309	174	Denmark 42; United Kingdom 17; Italy 17.
Pigments, mineral:			
Natural, crude	10,978	9,496	Netherlands 2,969; Denmark 2,674; Switzerland 815.
Iron oxides and hydroxides	99,762	113,896	France 16,660; United States 13,417; United Kingdom 11,037.

See footnotes at end of table.

Table 3.—Federal Republic of Germany: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
NONMETALS—Continued			
Precious and semiprecious stones, except diamond:			
Natural kilograms	119,885	142,364	United Kingdom 23,122; Italy 21,166; United States 14,405.
Manufactured do	6,504	7,922	United States 3,099; Netherlands 1,265; Thailand 820.
Pyrite (gross weight)	227	271	United Kingdom 111; France 41; Brazil 34.
Salt thousand tons	1,237	1,595	Belgium-Luxembourg 708; Denmark 295; Sweden 266.
Sodium and potassium compounds, n.e.s.:			
Caustic soda do	213	244	United States 48; Netherlands 26; Yugoslavia 26.
Caustic potash, sodic and potassic peroxides do	10	11	U.S.S.R. 2; United States 2; Switzerland 1.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous	3,889	3,421	Austria 1,503; Netherlands 538; Italy 536.
Slate	22,843	21,130	Netherlands 8,133; Belgium-Luxembourg 4,993; Italy 2,660.
Other	601,247	605,276	Netherlands 583,053; Switzerland 16,125; Austria 2,539.
Worked:			
Building and monumental stone	15,995	15,827	Netherlands 5,742; Belgium-Luxembourg 4,802; France 1,716.
Slate	918	924	Netherlands 460; Belgium-Luxembourg 333.
Paving and flagstone	18,847	21,110	Netherlands 10,427; Denmark 7,591.
Dolomite	73,621	132,546	Netherlands 82,785; France 25,314; Belgium-Luxembourg 14,860.
Gravel and crushed rock thousand tons	10,667	11,752	Netherlands 9,981; Switzerland 907; Belgium-Luxembourg 800.
Limestone do	96	130	Netherlands 115; Belgium-Luxembourg 10.
Quartz and quartzite:			
Quartz crystal kilograms	56	12	NA.
Other	49,018	54,844	Austria 13,413; Italy 9,752; Belgium-Luxembourg 8,554.
Sand excluding metal bearing thousand tons	6,876	7,025	Netherlands 6,358; Switzerland 272; Belgium-Luxembourg 178.
Sulfates, natural, magnesium sulfate (Kieserite) do	275	305	Netherlands 61; Norway 54; United States 27.
Sulfur:			
Elemental:			
Other than colloidal	35,834	34,135	Austria 8,115; Netherlands 2,567; Uganda 2,035.
Colloidal	2,291	2,892	Italy 543; United Kingdom 353; Republic of South Africa 266.
Sulfur dioxide	14,286	13,392	Belgium-Luxembourg 3,993; Sweden 2,716; Poland 2,527.
Sulfuric acid	167,528	107,965	Belgium-Luxembourg 72,567; France 18,150; Netherlands 9,017.
Talc, steatite, soapstone	5,550	6,268	Denmark 2,937; Netherlands 1,264; Switzerland 427.
Vermiculite, chlorite, perlite	562	301	Austria 209.
Other nonmetals, n.e.s.:			
Crude:			
Meerschaum, amber, jet kilograms	--	100	NA.
Pottery	6,507	5,820	Austria 2,647; Belgium-Luxembourg 1,841; Switzerland 372.
Other thousand tons	1,640	1,552	Netherlands 1,471; Belgium-Luxembourg 31; France 17.
Slag, dross and similar waste, not metal-bearing:			
From iron and steel manufacture do	1,602	1,542	Netherlands 1,194; France 313; Belgium-Luxembourg 30.
Slag and ash, n.e.s do	265	516	Netherlands 367; France 96; Belgium-Luxembourg 44.
Oxides and hydroxides of strontium and barium	2,586	3,029	U.S.S.R. 1,200; France 760; United Kingdom 502.
Building materials of asphalt, asbestos, and fiber cement, and unfired nonmetals, n.e.s	82,879	89,147	Netherlands 24,408; France 22,384; Belgium-Luxembourg 6,619.

See footnotes at end of table.

Table 3.—Federal Republic of Germany: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	1,980	544	Austria 163; Sweden 116.
Carbon, black	50,168	58,402	France 11,593; Netherlands 10,364; Belgium-Luxembourg 8,498.
Coal and briquets:			
Anthracite and bituminous thousand tons	17,552	15,597	France 6,115; Belgium-Luxembourg 3,445; Italy 3,064.
Briquets of anthracite and bituminous coal do	153	309	Austria 223; Switzerland 25; Belgium-Luxembourg 20.
Lignite and lignite briquets do	988	968	France 300; Austria 281; Italy 133.
Coke and semicoke do	[r]9,579	10,214	Belgium-Luxembourg 4,553; France 3,082; Netherlands 744.
Peat and briquets do	214	252	Netherlands 130; Switzerland 42; France 26.
Gas, natural do	289	299	Netherlands 108; Belgium-Luxembourg 75; Denmark 58.
Helium and other rare gases	[r]6,462	11,323	France 5,110; Belgium-Luxembourg 1,919; United Kingdom 1,900.
Petroleum:			
Crude and partly refined thousand tons	121	134	All to Austria.
Refinery products:			
Gasoline, motor spirit do	[r]1,106	799	Switzerland 420; Austria 200; Netherlands 49.
Kerosine, white spirit do	[r]753	888	Bunkers 753; Switzerland 100; Netherlands 21.
Distillate fuel oil do	[r]1,409	1,738	Switzerland 1,134; bunkers 313; France 135.
Residual fuel oil do	3,960	4,146	Bunkers 1,328; Austria 769; Netherlands 637; Belgium-Luxembourg 521.
Lubricants do	[r]356	396	Belgium-Luxembourg 75; United Kingdom 69; Netherlands 40; Switzerland 40.
Mineral jelly and wax do	96	109	Italy 16; Denmark 10; Netherlands 9; Sweden 6.
Other do	2,016	2,599	France 777; United Kingdom 760; Austria 276.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals do	350	224	United Kingdom 53; France 45; Netherlands 35; United States 25.

[r] Revised. NA Not available.

Table 4.—Federal Republic of Germany: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum:			
Bauxite thousand tons	2,019	2,627	Australia 1,143; Yugoslavia 652.
Alumina	84,416	119,523	Guinea 69,708; Surinam 25,278; Jamaica 11,186.
Aluminum hydroxide	1,312	1,438	United States 1,285.
Metal including alloys:			
Scrap	80,717	67,377	United States 21,604; Netherlands 10,161; Hungary 4,735.
Unwrought	421,776	433,818	Norway 150,312; United States 63,020; France 37,082.
Semimanufactures	102,089	93,768	Belgium-Luxembourg 28,492; France 27,954; Netherlands 18,286.
Antimony:			
Ore and concentrate	4,378	2,048	Bolivia 778; Turkey 505; Thailand 434.
Metal, including alloys, all forms	1,601	1,826	Italy 629; Japan 366; Belgium-Luxembourg 341.
Arsenic, hydroxide	959	1,157	Belgium-Luxembourg 653; France 305.
Beryllium metal, including alloys, all forms kilograms	243	369	United States 202; Japan 15.
Bismuth metal including alloys, all forms	236	218	Peru 51; Netherlands 34; Belgium-Luxembourg 27.
Cadmium metal including alloys, all forms	1,753	1,224	Belgium-Luxembourg 538; U.S.S.R. 212; Japan 119.

See footnotes at end of table.

Table 4.—Federal Republic of Germany: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS—Continued			
Chromium:			
Chromite	488,585	491,455	Republic of South Africa 254,571; U.S.S.R. 129,968; Turkey 46,160.
Oxide and hydroxide	1,445	1,025	Poland 21; Belgium-Luxembourg 20.
Metal including alloys, all forms kilograms	383,500	125,300	France 60,000; U.S.S.R. 44,800; Japan 12,200.
Cobalt metal including alloys, all forms	1,595	1,487	Belgium-Luxembourg 455; Zaire (formerly Congo-Kinshasa) 365; Finland 213.
Columbium and tantalum:			
Metal including alloys, all forms:			
Columbium kilograms	3,947	1,775	United States 694; United Kingdom 644.
Tantalum do	58,131	68,645	United States 50,308; United Kingdom 8,248; Belgium-Luxembourg 3,925.
Copper:			
Ore and concentrate	205,802	195,400	Chile 67,147; United States 41,698; Norway 29,287.
Matte	674	5,536	Australia 5,030.
Copper sulfate	4,886	4,834	France 1,655; Belgium-Luxembourg 924.
Metal including alloys:			
Scrap	123,184	113,377	United States 24,017; Netherlands 17,466; France 13,088.
Unwrought:			
Blister	[r] 144,802	133,317	Republic of South Africa 48,863; Chile 23,934; Zambia 20,359.
Refined	355,944	384,432	Chile 117,858; Belgium-Luxembourg 68,724; Zambia 65,185.
Alloys	61,643	53,972	United Kingdom 16,542; Netherlands 5,321; Sweden 4,279.
Master alloys	1,549	1,629	United Kingdom 717; Switzerland 676.
Semimanufactures	75,884	79,417	Belgium-Luxembourg 36,317; France 16,981; Netherlands 7,060.
Germanium metal including alloys, all forms kilograms	2,100	2,200	U.S.S.R. 1,000; Belgium-Luxembourg 900.
Gold:			
Ashes, residue and scrap thousand troy ounces	[r] 3,015	6,788	Switzerland 3,504; Sweden 1,118; Netherlands 714.
Metal:			
Unwrought do	4,018	3,460	Switzerland 1,828; Republic of South Africa 1,200.
Semimanufactures do	[r] 78	59	Switzerland 39; United States 11.
Iron and steel:			
Iron ore and concentrate thousand tons	43,421	47,818	Sweden 11,493; Liberia 8,191; Brazil 6,365; France 5,119.
Roasted pyrite do	1,635	1,562	Spain 602; Belgium-Luxembourg 304; Italy 153.
Metal:			
Scrap do	[r] 1,211	1,431	Netherlands 649; Belgium-Luxembourg 281; United Kingdom 116.
Pig iron, including cast iron do	165	166	Canada 68; France 58; Norway 21.
Sponge iron, powder and shot do	[r] 28	27	France 10; Sweden 9; United Kingdom 4.
Spiegeleisen	778	209	All from France.
Ferroalloys:			
Ferrochrome thousand tons	62	54	Republic of South Africa 29; United States 4; Finland 3; Italy 3.
Ferromanganese do	144	161	France 62; Norway 36; Belgium-Luxembourg 29.
Ferronickel do	20	21	New Caledonia 14; Greece 5.
Ferrosilicon do	107	137	Norway 57; France 31; United States 13.
Ferrosilicochrome do	[r] 14	16	Republic of South Africa 9; France 4.
Ferrosilicomanganese do	68	74	Norway 50; Republic of South Africa 8; Czechoslovakia 6.
Other do	14	15	France 7; Norway 3; Italy 1.
Steel, primary forms do	[r] 1,844	2,176	United States 648; Belgium-Luxembourg 439; Austria 359; France 173.
Semimanufactures:			
Bars, rods, angles, shapes, and sections do	[r] 3,032	2,953	Belgium-Luxembourg 1,538; France 559; Italy 184; Netherlands 156.
Universals, plates and sheets do	[r] 3,109	2,950	Belgium-Luxembourg 1,195; France 732; Netherlands 264.

See footnotes at end of table.

Table 4.—Federal Republic of Germany: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS—Continued			
Iron and steel—Continued			
METAL—Continued			
Semimanufactures—Continued			
Hoop and strip..thousand tons	[r] 522	441	Belgium-Luxembourg 266; France 68; Netherlands 60.
Rails and accessories..do	25	44	Netherlands 16; Czechoslovakia 9; Belgium-Luxembourg 8.
Wire..do	[r] 121	121	Belgium-Luxembourg 69; France 19; Netherlands 12.
Tubes, pipes, and fittings..do	[r] 327	320	Belgium-Luxembourg 76; Netherlands 62; France 42; Italy 31.
Castings and forgings, rough..do	19	26	Belgium-Luxembourg 8; France 4; Romania 3.
Lead:			
Ore and concentrate	231,747	283,307	Canada 73,615; Sweden 48,994; Peru 38,974.
Oxides	3,339	4,323	Belgium-Luxembourg 1,338; Mexico 707; Poland 520.
Metal including alloys:			
Scrap	20,828	26,314	France 10,862; Netherlands 2,881; Belgium-Luxembourg 2,715.
Unwrought	112,245	126,278	United Kingdom 52,005; North Korea 17,610; Australia 16,550.
Semimanufactures	[r] 1,875	2,480	Belgium-Luxembourg 1,605; France 479.
Magnesium:			
Oxides, hydroxides and peroxides	[r] 2,531	3,080	United States 1,200; France 748; United Kingdom 379.
Metal including alloys:			
Scrap	1,054	819	Czechoslovakia 372; Sweden 109; Netherlands 101.
Unwrought	49,027	52,233	Norway 23,531; United States 18,434; U.S.S.R. 4,338.
Semimanufactures	[r] 82	150	United States 78; Belgium-Luxembourg 25.
Manganese:			
Ore and concentrates..thousand tons	711	713	Republic of South Africa 339; Gabon 148; Brazil 69.
Oxides	2,871	3,651	Belgium-Luxembourg 2,439; Netherlands 871.
Metal	4,889	5,188	France 2,213; Republic of South Africa 1,145; United States 806.
Mercury..76-pound flasks	22,481	25,237	Spain 13,837; Mexico 3,771; Yugoslavia 2,959.
Molybdenum:			
Ore and concentrate	19,031	15,976	United States 4,389; Netherlands 3,918; Canada 3,396.
Metal including alloys, all forms	445	411	Austria 264; U.S.S.R. 60; Netherlands 44.
Nickel:			
Ore and concentrate	187	230	Canada 87.
Matte and speiss	2,244	4,246	Canada 3,715; Belgium-Luxembourg 176.
Metal including alloys:			
Scrap	15,327	7,720	United States 1,968; Netherlands 975; Canada 815.
Unwrought	28,415	38,780	United Kingdom 8,582; Canada 8,346; Norway 6,501; U.S.S.R. 5,504.
Semimanufactures	[r] 3,315	3,470	United Kingdom 1,094; United States 812; France 748.
Platinum-group metals and silver:			
Waste and sweepings..kilograms	355,021	250,516	Netherlands 46,630; Norway 44,202; Sweden 37,873.
Metals including alloys, all forms:			
Platinum group..thousand troy ounces	725	645	U.S.S.R. 171; United States 162; United Kingdom 139.
Silver	80,176	63,536	Belgium-Luxembourg 16,237; Switzerland 8,049; United Kingdom 6,878; Mexico 6,246.
Thorium, uranium and rare earth compounds	400	480	France 130; Austria 114; United Kingdom 108.
Tin:			
Ore and concentrates..long tons	7,655	5,891	Bolivia 5,805.
Oxides..do	189	167	Belgium-Luxembourg 109.
Metal including alloys:			
Scrap..do	201	298	Netherlands 150; Switzerland 82.
Unwrought..do	15,286	14,847	Malaysia 5,229; Netherlands 3,838; Indonesia 1,775.
Semimanufactures..do	[r] 23	71	Netherlands 49; United Kingdom 11.

See footnotes at end of table.

Table 4.—Federal Republic of Germany: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS—Continued			
Titanium:			
Ore and concentrate	[r]563,003	576,902	Norway 332,830; Canada 187,934.
Oxides	7,896	15,515	Belgium-Luxembourg 7,929; Netherlands 3,374.
Metal including alloys, all forms	2,191	4,465	U.S.S.R. 1,351; United States 1,311; United Kingdom 83.
Tungsten:			
Ore and concentrate	8,943	6,946	United States 4,463; Brazil 359; Bolivia 321.
Metal including alloys, all forms	[r]641	905	United States 356; France 111; Switzerland 83.
Uranium and thorium:			
Ore	5,155	5,445	France 5,428.
Metal including alloys, all forms kilograms	39,500	25,300	France 19,900; Belgium-Luxembourg 5,400.
Vanadium metal including alloys, all forms	--	25	Mainly from U.S.S.R.
Zinc:			
Ore and concentrate	350,588	363,758	Canada 191,529; Sweden 65,663; Ireland 29,669.
Oxide and peroxide	3,571	3,994	United States 1,263; France 1,082.
Metal including alloys:			
Scrap	966	2,487	Netherlands 869; Denmark 556; Sweden 391.
Dust	11,613	13,609	Belgium-Luxembourg 12,035; Norway 599.
Unwrought	182,475	154,958	Belgium-Luxembourg 77,287; Netherlands 16,188; Canada 10,189.
Semimanufactures	[r]15,601	15,626	Yugoslavia 5,989; France 4,084; North Korea 2,648.
Zirconium metal including alloys, all forms kilograms	123,500	88,000	United States 30,400; Sweden 28,900; United Kingdom 13,700.
Other:			
Ore and concentrate:			
Of columbium, tantalum, vanadium, and zirconium	34,092	44,310	Australia 36,282; United Kingdom 1,942; Brazil 1,370.
Of precious metal	1,893	397	All from Peru.
Of base metals n.e.s	3,696	2,109	Bolivia 1,342; Australia 616.
Ash and residue containing nonferrous metals	[r]186,036	166,224	United States 39,676; Belgium-Luxembourg 13,345; Republic of South Africa 12,164; Netherlands 10,594.
Oxides, hydroxides and peroxides of metals, n.e.s	5,228	5,205	United States 1,196; Belgium-Luxembourg 968; Republic of South Africa 731.
Metals including alloys, all forms:			
Metalloids:			
Arsenic and tellurium	68	82	Sweden 55; U.S.S.R. 16.
Selenium and phosphorus	15,804	28,897	NA.
Silicon	29,555	34,877	France 11,167; Norway 8,519; Switzerland 5,092.
Alkali, alkaline earth and rare-earth metals	2,011	769	United Kingdom 509; France 202.
Pyrophoric alloys	63	51	France 3.
Base metals, including alloys, all forms, n.e.s	843	1,518	Sweden 973; Austria 211.
NONMETALS			
Abrasives:			
Natural:			
Pumice, emery, and corundum	20,556	11,500	Italy 6,768; United States 1,870.
Dust and powder of precious and semiprecious stones thousand carats	3,792	4,241	United States 1,527; Ireland 958; United Kingdom 519.
Grinding and polishing wheels and stones	3,923	4,982	Austria 942; France 620; Spain 523.
Artificial:			
Corundum	10,918	12,817	Austria 4,820; France 3,156; Netherlands 1,598.
Silicon carbide	15,134	16,936	Norway 9,305; U.S.S.R. 2,742; Italy 2,214.
Asbestos	164,729	175,612	Canada 100,892; Republic of South Africa 26,588; U.S.S.R. 20,547.
Barite and witherite	60,546	97,397	Turkey 25,378; People's Republic of China 12,989; Romania 10,438.

See footnotes at end of table.

Table 4.—Federal Republic of Germany: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
NONMETALS—Continued			
Boron materials:			
Crude natural borates	107,775	129,661	United States 93,875; Turkey 29,710.
Oxide and acid	15,936	15,693	United States 5,994; France 5,266; Turkey 3,047.
Bromine	1,036	1,470	Israel 871; United Kingdom 422.
Cement thousand tons	532	727	France 290; Belgium-Luxembourg 164; Netherlands 88.
Chalk do	101	89	France 74; Denmark 9.
Clays and products (including all refractory brick):			
Crude:			
Fire clay do	241	282	Czechoslovakia 95; Republic of South Africa 77; France 43.
Kaolin do	543	642	United Kingdom 342; United States 156; France 61.
Kyanite, sillimanite, andalusite, mullite do	23	27	Republic of South Africa 10; India 10; United Kingdom 3.
Other do	229	283	United States 79; Netherlands 64; France 39.
Products:			
Refractory (including nonclay bricks) do	162	265	Austria 74; Czechoslovakia 55; Yugoslavia 30.
Nonrefractory do	767	734	Netherlands 425; Italy 112; Denmark 59.
Cryolite and chiolite	2,852	2,556	Denmark 2,495; United States 61.
Diamond:			
Gem:			
Crude or rough cut thousand carats	310	225	NA.
Other do	260	280	Belgium-Luxembourg 145; India 70.
Industrial do	755	785	Belgium-Luxembourg 250; Republic of South Africa 210; Netherlands 180.
Diatomite and other infusorial earths	64,762	70,372	Denmark 54,582; France 8,250; United States 5,975.
Feldspar, leucite, nepheline and nepheline syenite	71,641	81,560	Norway 47,797; France 13,117; Italy 10,304.
Fertilizer materials:			
Crude:			
Nitrogeneous	1,985	1,366	All from Chile.
Phosphatic thousand tons	2,726	2,802	United States 1,297; U.S.S.R. 850; Morocco 385.
Manufactured:			
Nitrogenous	r 292,331	348,358	Belgium-Luxembourg 270,486; Netherlands 37,153; Hungary 16,995.
Phosphatic:			
Thomas slag	424,350	421,369	Belgium-Luxembourg 400,051; United Kingdom 11,749; Sweden 9,569.
Other	r 30,210	27,605	Netherlands 10,200; Belgium-Luxembourg 6,107; Israel 3,929.
Potassic	88,467	22,528	France 14,625; Canada 5,111.
Mixed	r 256,599	194,310	Belgium-Luxembourg 146,064; France 41,466; United States 4,661.
Ammonia anhydrous	242,172	310,448	Netherlands 165,954; France 118,846; Belgium-Luxembourg 22,899.
Fluorspar	163,022	268,560	Spain 45,695; Republic of South Africa 34,069; Mexico 25,350.
Graphite, natural	21,306	26,882	People's Republic of China 5,590; Austria 5,358; Malagasy 3,405.
Gypsum and plasters	121,807	150,214	Austria 120,831; France 28,769.
Iodine	677	892	Japan 700; Chile 126.
Lime	r 184,123	199,998	France 193,495; Austria 3,338.
Lithium minerals	7,675	10,843	Netherlands 6,075; Brazil 3,031; Republic of South Africa 1,595.
Magnesite	467,006	424,774	Austria 128,625; Greece 102,656; Czechoslovakia 82,960.
Mica:			
Crude, including splittings and waste	8,557	9,108	Republic of South Africa 2,252; India 2,021; United Kingdom 1,289.
Worked, including agglomerated splittings	458	452	France 287; Belgium-Luxembourg 79.
Pigments, mineral:			
Natural, crude	2,746	2,161	Austria 1,336; Sierra Leone 585.
Iron oxides and hydroxides	1,320	1,043	France 590; United States 212; Netherlands 43.

See footnotes at end of table.

Table 4.—Federal Republic of Germany: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
NONMETALS—Continued			
Precious and semiprecious stones, except diamond:			
Natural thousand kilograms	1,631	1,810	Brazil 1,189; Republic of South Africa 165.
Manufactured do	21	20	Switzerland 13; France 3.
Pyrite (gross weight) thousand tons	1,803	1,630	Spain 481; Norway 400; U.S.S.R. 355.
Salt	177,194	337,378	Netherlands 275,806; France 59,488.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	218,309	190,451	Belgium-Luxembourg 113,947; Netherlands 51,764; France 14,826.
Caustic potash, sodic and potassic peroxides	7,456	5,774	France 139; Sweden 116; Czechoslovakia 98.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous	217,849	218,164	Austria 73,028; Italy 61,707; Portugal 20,608.
Slate	6,819	8,038	Portugal 1,899; United Kingdom 1,813; France 1,426.
Other	502,070	522,452	Sweden 189,915; Denmark 121,839; Republic of South Africa 64,995.
Worked:			
Building and monumental stone	235,807	269,174	Italy 231,493; Spain 10,323; Switzerland 8,178.
Paving and flagstone	142,880	150,935	Portugal 90,665; Romania 21,693; Poland 21,015.
Slate	9,941	10,397	Italy 6,000; France 1,146; United Kingdom 928.
Dolomite	467,894	356,018	Belgium-Luxembourg 286,238; Austria 46,080; France 18,576.
Gravel and crushed rock thousand tons	12,015	13,523	France 7,230; Denmark 3,283; Norway 609.
Limestone do	1,372	1,505	Austria 1,121; Sweden 214; Belgium-Luxembourg 94.
Quartz and quartzite:			
Quartz crystal kilograms	121	97	Japan 90.
Other	67,764	83,463	Belgium-Luxembourg 37,569; Sweden 16,910; Norway 6,397.
Sand excluding metal bearing thousand tons	2,268	2,576	France 1,571; Netherlands 633; Belgium-Luxembourg 284.
Sulfates, natural, magnesium sulfate (Kieserite)	115	143	NA.
Sulfur:			
Elemental:			
Other than colloidal	320,781	291,518	United States 107,314; Poland 95,650; France 78,173.
Colloidal	483	980	United States 850; Italy 113.
Sulfur dioxide	91	(1)	NA.
Sulfuric acid	115,649	173,835	Poland 35,672; Sweden 34,552; France 30,445.
Talc, steatite, soapstone	93,114	97,878	Austria 35,467; Italy 13,824; People's Republic of China 11,262; France 11,233.
Vermiculite, chlorite, perlite	48,656	56,574	Greece 24,953; Republic of South Africa 16,318; Hungary 13,964.
Other nonmetals, n.e.s.:			
Crude:			
Meerschaum, amber, jet	46	6	U.S.S.R. 4.
Pottery	12,014	13,487	U.S.S.R. 6,363; Czechoslovakia 1,583: Poland 991.
Other	577,418	347,117	Austria 150,859; France 90,468; Norway 49,488.
Slag, dross and similar waste, not metal bearing:			
From iron and steel manufacture thousand tons	1,641	1,724	France 990; Belgium-Luxembourg 460; United Kingdom 96.
Slag and ash, n.e.s do	121	128	Belgium-Luxembourg 50; Denmark 45; United Kingdom 15.
Oxides and hydroxides of strontium and barium	181	77	United States 63.
Building materials of asphalt, asbestos, and fiber cement, and unfired nonmetals, n.e.s	136,365	125,948	Belgium-Luxembourg 33,172; Sweden 20,197; Austria 18,671.

See footnotes at end of table.

Table 4.—Federal Republic of Germany: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	18,117	21,603	Trinidad 18,148; United States 3,362.
Carbon black	39,160	40,326	Netherlands 13,453; France 10,014; United States 7,218.
Coal and briquets:			
Anthracite and bituminous thousand tons	6,340	8,838	United States 3,776; United Kingdom 1,481; Poland 1,333.
Briquets of anthracite and bituminous coal do	448	300	Netherlands 259; France 29.
Lignite and lignite briquets do	[r] 1,171	1,103	Czechoslovakia 1,094.
Coke and semicoke do	729	610	France 132; United Kingdom 128; United States 73.
Peat and briquets do	33	36	Netherlands 19; Poland 8; Denmark 5.
Gas, natural do	4,074	6,297	Netherlands 6,145; Belgium-Luxembourg 57; France 43.
Helium and other rare gases	415	1,382	Belgium-Luxembourg 915; France 239; United States 134.
Petroleum:			
Crude and partly refined thousand tons	[r] 89,551	98,786	Libya 40,922; Saudi Arabia 12,058; Iran 8,269.
Refinery products:			
Gasoline, motor spirit do	[r] 2,055	2,280	Belgium-Luxembourg 673; Netherlands 516; France 383.
Kerosine, white spirit do	[r] 486	680	Netherlands 396; Belgium-Luxembourg 130; Italy 43.
Distillate fuel oil do	[r] 16,181	19,522	Netherlands 8,763; Italy 3,343; U.S.S.R. 1,858.
Residual fuel oil do	3,301	3,456	Netherlands 1,802; France 731; Italy 193.
Lubricants do	[r] 188	198	United Kingdom 53; Netherlands 40; United States 31.
Mineral jelly and wax do	83	87	United States 43; Netherlands 25; France 6.
Other do	2,824	4,144	Netherlands 2,233; United States 870; France 262.
Mineral tar and other coal–, petroleum–, or gas–derived crude chemicals do	448	630	Netherlands 323; Belgium-Luxembourg 76; United States 55.

[r] Revised. NA Not available.
[1] Less than ½ unit.

COMMODITY REVIEW

METALS

Aluminum and Bauxite.—Production of primary aluminum increased by 38 percent over the 1970 total of 309,300 tons, due to utilization of new smelter capacity during 1971. Total production of 427,500 tons was equivalent to 18.8 percent of West Europe's output, including the United Kingdom. West Germany's bauxite production dropped by 5.5 percent, to 2,871 tons.

Apparent consumption of ingot aluminum rose only 3 percent, from 881 million to 908 million tons including depletion in stocks of 15 million tons during the year.

Startup of two new electrolysis plants in January resulted in additional smelter output during 1971 of 100,000 tons. The largest addition was at Leichtmetall-Gesellschaft's Essen plant and the other at Kaiser-Preussag's Voerde plant. These and the 1970 startups came at a time of general worldwide market weakening, which together with a special economic and monetary situation within the country affected the domestic market adversely. One result of this was a delay by two producers in starting up completed pot lines with a capacity of about 90,000 tons. Furthermore, construction of new capacity previously planned was deferred. This was done in order not to add further to the market imbalance by increasing home production.

Prices of primary aluminum in West Germany reached new low levels during the year, with domestic oversupply and surplus stocks forced to compete with foreign supplies imported at marginal costs.

In response to realignment of exchange rates, primary aluminum producers reduced book prices from DM230 to DM 216 per 100 kilograms as of January 1, 1971. However, market conditions forced actual selling prices reportedly to between DM160 and DM180 and even lower.

Firms representing about 90 percent of the domestic primary and semimanufactures production made a study in October of the economic situation. Results indicated a total loss expectancy by the firms involved of an estimated DM50 million corresponding to a negative yield on turnover of minus 1.7 percent and a negative interest on private capital of minus 5.6 percent. This compares with a plus 1.7 percent yield and plus 6.5 percent interest return in 1970.[2]

Imports of semimanufactures for the first time showed an excess over exports, with indicated increases of 20 percent in imports and 11 percent in exports. Imports of foil and thin strip showed a decrease of approximately 2 percent; exports were slightly less.

West German foundries were affected by the market situation and had a 5.7-percent reduction in castings, mainly because of decreased production in the vehicle and machinery industry during the year. Production of semimanufactures and castings in metric tons were as follows:[3]

Material	1970	1971
Aluminum and aluminum alloys, castings	235,484	222,169
Semimanufactures (rolled and extruded parts)	554,318	606,833

Uses of the 536,173 tons of semimanufactures delivered in 1970 and 581,880 tons in 1971 to consumer groups were reported in metric tons as follows:

Use	1970	Percent of total	1971	Percent of total
Packaging and small containers	143,749	26.8	155,915	26.8
Electrical industry	57,178	10.7	58,516	10.1
Building and construction	98,318	18.3	118,432	20.3
Transportation, including large containers	45,759	8.5	44,097	7.6
Iron, sheet and metal wares	41,816	7.8	47,772	8.2
Exports, trade	73,328	13.7	83,617	14.4
Other	76,025	14.2	73,531	12.6
Total	536,173	100.0	581,880	100.0

Domestic recovery of secondary aluminum from old scrap increased to 275,711 tons in 1971, 7 percent more than in 1970. Imports of scrap declined to 58,966 tons, 12.4 percent less than in 1970. About one third of the scrap came from the United States.

A spokesman for the West German aluminum industry expressed optimism for the industry's future, based on the expectation that the industry's average annual growth rate of 7.5 percent during 1960–1970 would continue and that trade balances would improve after adjustment of monetary relations.

Construction of an alumina plant at Stade was continued by Aluminum Oxid Stade G.m.b.H., owned 50 percent by Reynolds International, Inc. Completion of the first stage, with an annual production capacity of 700,000 tons, was scheduled for 1973. A second alumina development was projected by Alusuisse Atlantik G.m.b.H. of Wilhelmshaven. This plant would have a production capacity of 1 million tons per year and would be operative after 1975.

Copper.—Production of refined copper, including that derived from secondary sources, declined only 1.4 percent to 400,000 tons in 1971. Mine production of copper in 1971 was 1,484 tons, slightly more than in 1970. Consumption of refined copper decreased by 4.7 percent, to 664,400 tons. Trade in copper for 1971 in tons was as follows:

	Exports	Imports
Ore	1,100	171,248
Matte	6,848	2,349
Scrap:		
Copper	10,887	47,775
Copper alloy	24,777	32,678
Metal:		
Blister for refining	594	155,679
Refined, not alloyed	103,135	363,121
Refined, alloyed	7,751	50,009
Semimanufactures including bars, sections, wire, sheet metal, plates, strip foil, pipe and tubes:		
Unalloyed	36,433	55,623
Alloyed	66,161	27,788
Flake and powder:		
Unalloyed	75	3
Alloyed	3,865	212

Copper smelters operating in 1971, their locations, and their annual capacities were as follows: Duisburger Kupferhütte, Duisburg, 30,000 tons; Hüttenwerke Kayser A.G., Lünen, 75,000 tons; and Norddeutsche Affinerie, Hamburg, capacity not available. Kayser also operated a refinery at Lünen, which had a capacity corresponding to the smelter. Norddeutsche Affinerie's refinery at Hamburg had an annual capacity of 220,000 tons. This company took over a third refinery, Zinnwerke Wilhelmburg, at Hamburg.

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[2] Constance, P. Meyer. Aluminum (Düsseldorf), v. 48, No. 1, January 1972, pp. 53–57.

[3] U.S. Embassy, Düsseldorf, West Germany. State Department Airgram A–66, Apr. 28, 1972.

Iron Ore.—Iron ore production decreased about 9 percent compared with that of 1970. In terms of iron content the 1971 production was equivalent to approximately 1.63 million tons, or about 7 percent of the iron contained in iron ore consumed in domestic production of pig iron. Sweden, Liberia, and Brazil were the major suppliers of iron ore to West Germany; Liberia exported approximately one-third of its production or 6.5 million tons to West Germany.

Iron and Steel.—The depressed steel market of 1970 in West Germany worsened in 1971 as the country felt the effects of internal economic problems as well as a declining world demand. Circumstances which built up and seemed to hit the country especially hard resulted in its steel production having perhaps the highest cost increases of the European Coal and Steel Community (ECSC) countries. Crude steel production dropped to 40.31 million tons, a decrease of 10.5 percent from 1970's total of 45.04 million tons. Only one other major producing country, the United Kingdom, showed a higher decrease in production.

West Germany's steel production was 38.7 percent of the European Economic Community (EEC) total and 6.9 percent of world output. Comparable figures for 1970 were 41.2 percent and 7.6 percent, respectively.

Utilization of crude steel capacity was rated at 70 percent, compared with 85 percent in 1970. Approximately 4.5 million tons of capacity was added in 1971. Capital investments in the industry were estimated at $690 million, compared with expenditures of $627 million in 1970.

Basic oxygen furnaces accounted for 61.8 percent of total steel production, open hearths 21.2 percent, electric furnaces 10.0 percent, and the Bessemer process 7.0 percent.

Supplies of basic materials were plentiful but at increased costs. The one noticeable exception was scrap, which showed a decrease. One steel firm reported an increase in unit cost of crude steel produced of 9 percent during the year. All major steel companies reported losses for the year, resorting to financial reserves or nonsteel operations profits to pay dividends.

Wage and salary expenses for the steel industry were up 1.4 percent, and the number of man-hours worked were down 10 percent. However, labor productivity improved an estimated 3 percent.[4]

Wage negotiations were underway at yearend between the organized steelworkers and the employers in North Rhine-Westphalia where the bulk of the steel industry is located. Approximately 230,000 workers were involved and settlement was expected to result in at least a 6-percent wage increase, with the Metalworkers Union seeking 10 percent. Plans were in progress for the shutdown of marginal plants, which would affect up to 10,000 workers.

Published prices for domestic steels were fairly stable, with the producer price index 4 percent above that for 1970. However, sizable discounts were given by domestic dealers in the face of import competition and a declining domestic market. Shipments of domestic steel in West Germany were down almost 19 percent from 1970.

Exports of finished and semifinished steel were up 11 percent compared with an increase of 6 percent in imports. Exports were boosted by some steel mills to keep production up in face of weak domestic demand.

Foreign trade in iron and steel for principal categories in million tons is as follows:

	1970	1971
Exports:		
Ferrous scrap	2.2	2.1
Pig iron and ferroalloys	.9	.8
Semifinished steel, including coils	1.7	2.5
Finished rolled and forged steel	9.3	9.7
Imports:		
Ferrous scrap	1.4	1.0
Pig iron and ferroalloys	.3	.2
Semifinished steel, including coils	2.2	1.5
Finished rolled and forged steel	6.5	7.8

Ten percent of West Germany's steel shipments were consigned to EEC markets in 1971, 16 percent to other foreign markets, and the remainder to domestic mar-

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[4] U.S. Embassy, Düsseldorf, West Germany. State Department Airgram A-88, June 2, 1972.

Table 5.—Federal Republic of Germany: Scrap supply and consumption

(Thousand metric tons)

	1969	1970	1971
Source:			
Iron and steel plants	10,640	10,096	8,856
Foundries	2,738	2,857	2,579
Purchases:			
Domestic	8,265	8,269	7,651
Imported	1,141	1,384	952
Other, including variation in stock estimates	2,305	[r] 3,329	3,279
Total, new supply	25,089	[r] 25,935	23,317
Consumption:			
Iron and steel plants	18,379	18,439	16,427
Iron and steel foundries	5,088	5,233	4,744
Consigned for export	1,757	2,149	2,082
Stocks at year end	1,936	[r] 2,049	2,164

[r] Revised.

Table 6.—Federal Republic of Germany: Salient statistics of the iron and steel industry

(Thousand metric tons unless otherwise specified)

	1969	1970	1971
PIG IRON			
Producing plants, number	25	24	23
Blast furnaces available, do	110	104	98
Blast furnaces in operation at yearend, do	91	80	71
Maximum production capacity	[r] 36,800	[r] 36,510	36,480
Production:			
Thomas	15,344	13,729	11,819
Open hearth	15,857	17,391	16,122
Foundry	305	324	280
Spiegeleisen and blast furnace ferromanganese	238	251	210
Other	2,020	1,932	1,559
Total	33,764	33,627	29,990
Blast furnace charge:			
Iron ore:			
Domestic	1,525	1,258	953
Iron content	509	443	365
Imported	18,548	18,026	14,425
Iron content	11,255	10,882	8,668
Sinter and briquets	34,147	34,858	32,662
Iron content	18,854	19,349	18,157
Manganese ore	542	508	421
Iron content	72	65	46
Other iron-bearing materials:			
Slag, scale, cinder, dust	3,728	3,485	3,209
Scrap	518	533	543
Limestone	1,139	1,209	919
Phosphate rock	[r] 202	[r] 184	123
Coke:			
Total	19,038	18,787	15,638
Kilograms per ton of iron produced	563	558	520
STEEL			
Converters:			
Basic bessemer:			
Total, number	34	18	18
In operation at end of year, do	29	18	18
Oxygen:			
Total, do	34	43	40
In operation at end of year, do	25	31	29
Furnaces:			
Open hearth:			
Total, do	121	114	89
In operation at end of year, do	92	79	46
Electric:			
Total, do	183	176	176
In operation at end of year, do	165	151	159
Maximum production capacity (all furnaces)	[r] 50,580	[r] 53,100	57,875
Production of crude steel:			
Basic Bessemer	6,807	3,640	2,831
Oxygen	20,838	[r] 25,137	24,908
Open hearth	13,515	11,819	8,537
Electric	4,146	4,436	4,080
Other	10	9	7
Total	45,316	45,041	40,313
Ingots	44,599	[r] 44,315	39,655
Liquid steel for castings	717	725	659

See footnotes at end of table.

Table 6.—Federal Republic of Germany: Salient statistics of the iron and steel industry—Continued

(Metric tons unless otherwise specified)

	1969	1970	1971
STEEL—Continued			
Furnace feed for ingot steel:			
Pig iron:			
Total	30,860	30,469	27,446
Kilograms per ton crude steel	(692)	(688)	(692)
Scrap:			
Total	17,855	17,882	15,874
Kilograms per ton crude steel	(400)	(404)	(400)
Preblown Thomas and other presmelted steels	[r] 51	[r] 137	15
Ferroalloys and alloying metals	409	435	356
Other iron-bearing materials	1,113	1,152	1,116
Iron and manganese ores	990	879	597
Total iron-bearing materials	[1] [r] 51,279	[r] 50,954	45,404
Limestone	[r] 3,384	[r] 3,326	2,822
CASTINGS			
Iron and steel foundries in operation number	NA	--	--
Production of iron and steel castings	4,659	4,877	4,313
Consumption of raw materials:			
Pig iron	2,101	2,269	1,924
Scrap	5,088	5,233	4,744
Ferroalloys and other metals	83	102	92
Total	7,272	7,604	6,760
EMPLOYMENT			
In coking plants of smelters persons	2,196	2,834	2,841
Blast furnace, steel mills, hammer and forge shops do	371,622	374,428	354,590

[r] Revised. NA Not available.

[1] Data may not add to total shown because of independent rounding.

Table 7.—Federal Republic of Germany: Raw materials consumed in the production of pig iron

(Thousand metric tons unless otherwise specified)

Commodity	1969	1970	1971
Iron ore:			
Domestic	5,980	5,752	4,900
Imported	43,325	43,732	39,261
Total	49,305	49,484	44,161
Manganese ore	665	702	562
Pyrite cinder	3,879	3,663	2,893
Slags and plant scale	6,322	6,130	5,543
Blast furnace dust	1,687	1,635	1,429
Scrap	518	533	543
Total gross weight of metallic raw materials	62,376	62,147	55,131
Iron content of total metallic raw materials:			
Iron ore:			
Domestic	1,916	1,820	1,575
Imported	24,853	25,205	22,635
Manganese ore	77	75	73
Pyrite cinder	1,894	1,789	1,427
Slags and plant scale	2,730	2,687	2,409
Blast furnace dust	629	621	525
Scrap	412	421	438
Total iron content	32,511	32,618	29,082
Limestone	3,425	3,844	3,505
Phosphate	186	[r] 184	123
Total gross weight of metallic raw materials, limestone, and phosphate	65,987	66,175	58,759
Coke	19,038	18,787	15,638

[r] Revised.

kets. The United States was the major importer outside of the Common Market.

Plant expansions and future plans for increased production were made by the steel industry during the year in spite of a dismal steel forecast for 1972.

August-Thyssen Huette A.G. (ATH) continued to be Europe's leading steel pro-

Table 8.—Federal Republic of Germany: Production of sinter and consumption of raw materials

(Thousand metric tons unless otherwise specified)

	1969	1970	1971
Production:			
Gross weight	34,159	35,008	32,805
Iron content	18,882	19,459	18,313
Consumption of raw materials:			
Iron ore	29,353	30,394	28,925
Cinder	3,840	3,624	2,853
Slags and scale	2,635	2,684	2,374
Blast furnace dust	1,686	1,635	1,429
Limestone	[r] 2,286	2,634	2,586
Iron content of materials consumed:			
Iron ore	15,010	15,710	15,184
Cinder	1,885	1,781	1,419
Slag and scale	1,425	1,487	1,315
Blast furnace dust	628	621	525
Total	18,948	19,599	18,443

[r] Revised.

Table 9.—Federal Republic of Germany: Production of finished steel

(Thousand metric tons)

	1969	1970	1971
Wire rods	3,394	3,520	3,293
Bars and rods	6,306	6,315	4,923
Angles, shapes, sections (excluding rails)	2,423	[r] 2,519	2,012
Universal plates	565	524	402
Other heavy plates and sheets (more than 4.75 millimeters thick)	4,671	4,786	4,233
Medium plates and sheets (3 to 4.75 millimeters)	643	533	429
Thin plates and sheets (less than 3 millimeters)	6,937	6,860	6,562
Hot rolled strip including skelp	3,075	2,793	2,483
Hot rolled wide strip	1,993	2,121	2,336
Rails and railway track material	445	511	450
Seamless steel tubes	1,794	1,810	1,594
Total finished steel	[1] 32,247	[r] [1] 32,291	28,717
Selected semimanufactures:			
Tin plate	720	749	779
Galvanized and terneplate	1,000	[r] 1,004	1,147
Steel pipe welded	1,556	1,584	1,830
Extrusions and forgings	677	688	565
Steel castings	378	391	343

[r] Revised.
[1] Data may not add to totals shown because of independent rounding.

ducer and had two steel mill projects planned in Brazil with a Brazilian group in addition to its domestic investments. Domestic investments by the company included about $100 million for its new Schwelgern works where construction was underway on a 46-foot blast furnace.

Hoesch A.G. was expanding its steel-rolling facilities in the Dortmund area, enlarging a hot-strip mill at the Westfalenhuette works to 3.2 million tons annually, and constructing a new cold rolling mill and continuous casting plant at other sites.

The Klöeckner-Werke A.G. planned to invest an average of over $50 million per year for the next few years in plant facilities. Included was a 39-foot blast furnace, and a hot strip mill with a 3-million-ton annual capacity.

Mannesmann A.G. planned to invest approximately $450 million over a 5-year period through 1974. This included a seamless pipe plant and a high-capacity pressurized blast furnace to be completed in 1972.

Friedrich Krupp Hüttenwerke A.G. completed a continuous slab casting plant at Rheinhausen with a capacity of 1 million tons per year, to be expanded on completion of a new basic oxygen plant in 1974. This would be part of an approved $125 million investment program for 1972–74 to include a second Sendzimir mill at the Düsseldorf works.

Peine-Salzgitter A.G., formed by merger of Salzgitter and Ilseder Hütte in 1970, was the third largest steel producer of West Germany. Salzgitter was involved in plans for a new steelworks on the Elbe estuary near Emden within the next 10 years.

The Korf Group, with headquarters in Baden-Baden, was nearly completed with construction of its mini-steelworks at Hamburg. The plant, Hamburger Stahlwerke G.m.b.H., would be the first steel operation based on direct reduction in West Germany and will have an annual production capacity of 450,000 tons of steel mill products.

West German ferrous scrap consumption by the steel industry declined by 2.5 million tons in 1971. Purchases by the steel mills dropped 12 percent from those of 1970, to 6.63 million tons, while purchases by the iron foundries dropped by 7 percent to 1.97 million tons.

Lead-Zinc.—Lead production on mine basis amounted to 41,339 tons and on smelter basis, from primary and secondary sources, 301,200 tons; zinc ore production on zinc content basis was 131,984 tons, including production from pyrites. According to American Bureau of Metal Statistics,[5] apparent lead consumption, including some scrap, was 350,400 tons, and zinc consumption was 376,800 tons, not including zinc dust and zinc oxide derived directly from ore.

Lead and zinc were consumed principally as follows in thousand metric tons:

	1970	1971
Lead:		
Cable sheath	80.4	74.0
Storage batteries	118.8	112.8
Pigments and chemicals	68.0	68.9
Semimanufactures	51.1	49.7
Castings	5.8	5.1
Type metal, antifriction metal, and lead-tin alloys	6.5	6.4
Protection of surfaces, powders, etc	4.9	4.4
Collapsible tubes and capsules and miscellaneous	23.4	20.2
Total	358.9	341.5
Zinc:		
Galvanizing	137.8	140.4
Diecasting alloys	83.3	83.6
Brass and rolled zinc	201.1	159.7
Oxides	27.4	17.6
Miscellaneous	2.1	6.6
Total	451.7	407.9

Export and import trade in lead and zinc was as follows in thousand tons:

Commodity	Exports		Imports	
	1970	1971	1970	1971
Lead:				
Ore and concentrate	1.9	2.8	283.3	223.0
Scrap	15.5	15.4	26.3	13.2
Crude lead for refining	1.4	3.6	76.8	80.7
Refined lead	44.4	56.1	40.4	32.7
Lead-antimony alloys	4.2	3.9	10.7	10.5
Other lead alloys	2.6	8.5	3.4	2.5
Zinc:				
Ore and concentrate	49.9	55.2	363.8	355.2
Scrap	5.9	5.8	2.5	3.2
Crude zinc	21.5	12.7	54.0	47.6
Refined zinc	26.0	25.5	92.0	114.5
Remelted zinc	3.3	3.9	1.2	1.8
Zinc alloys	3.3	7.5	7.7	7.0
Powder and dust	3.9	3.1	13.7	12.8

The new Preussag Weser Zink G.m.b.H. plant at Nordenham started up during the year. The plant, owned by Preussag A.G. of West Germany (75 percent) and Penarroya of France (25 percent), was designed for an output of 100,000 tons per year of electrolytic zinc. Cost of the plant was approximately DM130 million. A second electrolytic zinc plant, Ruhr-Zinc G.m.b.H., continued operation at Datteln with an estimated capacity of 130,000 tons per year. Zinc smelters operating in 1971 and their estimated annual zinc production capacity were "Berzelius" Metalhütten G.m.b.H., Duisburg-Wanheim, 90,000 tons; and Preussag A.G. Metall, Harlingerode, 94,000 tons. In addition, Duisburger Kupferhütte, Duisburg, produced zinc oxide as a byproduct from pyrites cinder.

Metallgesellshaft A.G. of Frankfurt acquired an option on a 40-percent interest in Andaluza de Piritas S.A. of Spain, which was to develop pyrite deposits at Aznacollar near Seville. The pyrite deposits, estimated at 50 million tons, would yield about 2.4 million tons of zinc and 1 million tons of lead. The startup date was given as 1975 for initial mining of 1.5 to 2 million tons per year of pyrites.

Magnesium.—Imports of unwrought

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[5] American Bureau of Metal Statistics. Yearbook 1971. 148 pp.

magnesium in 1971, including alloyed and nonalloyed metal, totaled 46,629 tons, while wrought magnesium totaled 168 tons. Exports of both types totaled 222 tons. Scrap imports were 422 tons, and exports 1,785 tons. Consumption was off, partly because of the general decline in the economy and because of decreased demand by Volkswagenwerke A.G., the largest single user of magnesium in the world.

Tin.—Statistical data for tin in 1971, in long tons, were as follows:

Smelter production	1,151
Imports:	
Ore	6,184
Scrap	395
Metal	15,005
Alloys	233
Exports:	
Ore	6
Scrap	340
Metal	919
Alloys	241
Consumption (primary tin metal)	13,978

Uranium.—The Federal budget for the nuclear energy program in 1972 was increased 5.5 percent compared with that of 1971, the total being DM1,306.2 million. Of this, uranium supply accounted for DM31.2 million, 30 million of which was for securing uranium and the remainder for storage of fuel and operation of an ore preparation test installation.

General methods of uranium enrichment were being studied and reviewed by independent agencies. The results of the development of the gas centifuge was reported as justifying the expectation that this process could be applied in the foreseeable future. A gas ultracentrifuge project, with joint participation by the Netherlands and the United Kingdom, was to receive DM620 million as West Germany's contribution for a 5-year period starting in 1972. The jet nozzle process development was being funded at Karlsruhe, and the feasibility of erecting a diffusion enrichment facility in Europe was under joint study with the French Atomic Energy Commission.

The West German Science Ministry estimated domestic uranium oxide requirements for its atomic energy program until 1980 at 35,000 to 40,000 tons. About 40 percent of this tonnage would be purchased on the free world market, the remainder to be supplied, if possible, by German prospecting companies operating abroad. The two principal companies were Urangesellschaft (UG), jointly owned by the firms of Steag, Essen (a subsidiary of Ruhrkohle and Veba, a partly Government-owned public utility concern) and Metallgesellschaft, Frankfurt; the other company, Uranerzbergbau G.m.b.H., was formed by Rheinisch-Westfälische Braunkohlenwerke, a public-utility and mining company, and C. Deilmann, a private mining firm from Bentheim. These companies will receive continued government assistance; they have been actively prospecting in Africa, Australia, Canada, and the United States. UG has prospected in New Mexico under joint agreement with the Atlantic Richfield Corp. The company also holds concessions in Utah and Wyoming, which may be exploited at a future date.

NONMETALS

Cement.—West Germany ranks as the world's fourth largest cement user, shipments being in excess of 200 million barrels. Use of ready-mix concrete is growing and the country has the world's largest organization of this type, a company operating 200 batch plants. Sales of concrete in the country were approximately $500 million. The cement industry's trade figures for 1971, in thousand tons, were as follows:

	Exports	Imports
Clinker	75	270
Portland	715	259
Iron, portland and blast furnace slag	430	386
Other	174	114

Fertilizers.—Production of nitrogen fertilizers amounted to 964,010 tons of contained nitrogen in 1971, a decrease of 15.7 percent from the domestic output of 1970. This occurred in spite of an increase in farm consumption and was covered by increased imports. The largest import increases were from the Communist bloc countries, which shipped principally calcium ammonium nitrate and urea.[6] To meet the lower import prices and reduce operating costs, West German producers proposed changes in distribution policies which would permit the formation of a syndicate to define marketing areas. Also, development of bulk distribution facilities were considered in order to eliminate bagging costs, as approximately 80 percent of the fertilizers were transported in bagged form. West German farmers were said to pay the highest tax rate on fertilizers in the EEC.

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[6] European Chemical News. V. 20, No. 507, Nov. 19, 1971, p. 8.

Production of potash increased 5.9 percent over that of 1970, the marketable products having 2,443,011 tons of K_2O content. Crude potash mined to obtain this tonnage amounted to 22,305,681 tons. Value of the marketable potash was DM467,114. About one-half of the production was in the form of potassium chloride with a minimum of 60 percent equivalent K_2O content and one-fourth with a minimum of 50 percent equivalent K_2O content; the remainder contained lower grade potash and potassium sulfate. Utilization of production capacity was reported at 81 percent in 1971.

Consumption of domestic potash was up 2.8 percent, to 1,354,400 tons of K_2O equivalent. Of this amount, 95 percent was used for agricultural purposes in mixed fertilizers or as single-element fertilizer.

Exports of potash declined 2.3 percent compared with those of 1970 and were 42 percent of 1971 production. Trade with Poland declined further because of competition with the U.S.S.R. However, shipments to the United States in 1971 were up 50 percent. Producers hoped also to increase shipments to the developing countries of Africa, Asia, and Latin America.

Integration of the West German potash industry occurred in 1970–71, and the new potash mining unit, Kali und Salz (K&S), Kassel, accounted for 85 percent of the total potash output. Although domestic ceiling prices did not change in 1971, the advances in technology were apparently sufficient to keep the effects of spiraling costs, mainly labor and transportation, within limits. Labor costs have been about 45 percent of total production costs.

Chemical production of phosphatic fertilizers (P_2O_5 equivalent) increased from 480,000 to 526,000 tons or 9.6 percent over that of 1970. Exports and imports were distributed by types, in thousand tons, as follows:

Type	Exports	Imports
Phosphate rock	--	2,384
Thomas slag	196	432
Superphosphate	2	16
Other	1	7

Fluorspar.—Domestic production of fluorspar continued at about the normal level of about 85,000 tons, most of it acid grade and produced at four established flotation plants, which are controlled by chemical and aluminum producers for captive use. The major requirements for metallurgical purposes were met from foreign sources, mainly from France and Spain.

Sulfur.—Sulfur recovery from sour natural gas was expected to become increasingly important to supply domestic needs, and eventually export demands.

A major expansion at the Voigtei plant of Norddeutsche Erdgasaufbereitungs G.m.b.H. (Nienburg) was underway which would increase daily sulfur recovery capacity from 360 tons to over 1,000 tons. Sour gas from the Weser-Ems gasfields is treated at this plant. A new plant with a capacity of 1,000 tons per day was planned by Gewerkschaft Brigitta to be located at Grossenkneten, near Oldenburg. It was expected that by 1975 the two plants would be producing almost 600,000 tons of recovered sulfur annually, equivalent to five times the current West German output from natural gas and crude oil.[7]

Total sulfur obtained in West Germany by chemical processing or recovery methods amounted to 183,944 tons.

MINERAL FUELS

Energy consumption in 1971 totaled 340.3 million tons of standard coal equivalent (SCE), with petroleum and natural gas continuing to gain at the expense of coal. Comparative shares of the market provided by various energy sources, together with revised corresponding values for 1970, in percent, are as follows:

Energy source	Percent of total primary energy consumption	
	1970 r	1971
Anthracite and bituminous coal	28.8	26.7
Lignite and brown coal	9.1	8.6
Petroleum	53.0	54.7
Natural gas	5.5	7.0
Hydroelectric power	2.5	1.9
Nuclear energy	.6	.6
Firewood, peat and other	.5	.5
Total	100.0	100.0

r Revised.

Coal.—Coal production was essentially the same as in 1970, mainly because of stockpiling. Coal demand slackened during the year chiefly because of a worldwide decrease in steel production and an exceptionally mild winter. Mines were kept operating, resulting in a buildup of pithead coal stocks amounting to approximately 8 million tons by yearend. Sales of hard coal were down by an estimated 11.7 million tons from the 114.5 million tons in 1970. Consumption of coal for electric power increased slightly, although increasing use of petroleum and natural gas combined with plans for nuclear powerplants indicates a gradual decrease in dependence on coal for electric power production in the future.

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[7] Sulfur (London). New Plants and Projects, West Germany. No. 92, January–February 1971, p. 17.

Ten pits with a capacity of 14 million tons were scheduled to be closed by 1975 in efforts to consolidate the more productive of the West German mines and eliminate those operating on an uneconomical basis. This is a continuation of the changes which have been taking place in the Ruhr, where over 80 percent of West Germany's coal is produced. The number of miners employed decreased between 1957 and 1971 from approximately 452,100 to 151,000. Another 25,000 or more are expected to be phased out within the next 5 years. However, mine selection and technological improvements are expected to result in increased productivity sufficient to keep production up. Present unit output at fully mechanized mine working faces of 1,100 tons per day would have as a goal an increase to 3,000 tons per day.

The consolidated Ruhr coal company, Ruhrkohle A.G., established under sponsorship of the Government to solve the country's coal production problems, ran into serious financial difficulties in 1971. Action

Table 10.—Federal Republic of Germany: Coal and lignite industry

(Production, productivity, and employment)

		1969	1970	1971
BITUMINOUS AND ANTHRACITE				
Production:[1]				
Ruhr	million tons	91.2	[r]91.1	90.7
Saar	do	11.1	10.6	10.7
Aachen	do	6.7	6.9	6.6
Lower Saxony	do	2.6	2.8	2.8
Total	do	111.6	[r]111.4	110.8
Output per man-shift:				
Ruhr:				
Underground	kilograms	3,774	3,843	3,893
Total mining	do	2,986	3,068	3,239
Federal Republic average:				
Underground	do	3,665	3,755	3,828
Total mining	do	2,913	3,001	3,158
Employment:				
Ruhr:				
Underground	thousand persons	111.0	109.2	107.9
Mine surface	do	31.6	31.5	23.9
Cleaning	do	15.8	12.8	10.7
Total including other workers and salaried employees	do	206.0	198.9	197.8
Federal Republic total:				
Underground	do	140.6	137.7	135.2
Mine surface	do	38.6	[r]38.5	31.0
Cleaning	do	19.1	[r]16.8	14.8
Total including other workers and salaried employees	do	257.7	249.7	247.8
LIGNITE AND SUBBITUMINOUS				
Production:				
Rhineland	million tons	92.7	93.0	90.5
Helmstedt, Hesse, and Bavaria	do	14.7	14.7	14.0
Total	do	107.4	[2]107.8	104.5
Employment:				
Rhineland:				
Open pit	thousand persons	6.5	4.7	4.6
All other	do	10.5	11.4	11.3
Total	do	17.0	16.1	15.9
Helmstedt, Hesse, and Bavaria	do	7.4	7.0	6.8
Total	do	24.4	23.1	22.7
PITCH COAL				
Production	million tons	.8	.7	.07
Employment	thousand persons	1.9	1.4	.3

[r] Revised.

[1] Excludes small mines and leases.

[2] Data may not add to totals shown because of independent rounding.

by the Federal and State Government (North Rhine-Westphalia) was necessary as losses of over $100 million occurred during the year, and was complicated by the fact that large stocks of coal and coke were acquired to keep the miners employed. Financing by the Government of these stocks was expected, along with other assistance to keep the organization solvent.

Future demand for coking coal is expected to continue and in spite of sulfur restrictions introduced by environmental pollution regulations, no technical problems are foreseen in meeting future demands of the steel industry. For the next few years demand for coking coal is expected to be maintained at about 80 to 90 million tons per year. Construction of new coking plants was underway, and more economical operations can be expected.

The use of coal to produce electric power is expected to continue at about the same level for the near term. Of the 242,889 gigawatt-hours (Kilowatt-hour x 10^6) of electrical energy produced in 1971, coal and lignite accounted for approximately 65 percent. In 1971, brown coal used in conventional plants to produce electric energy totaled 82.2 million tons and hard coal 42.4 million tons. In 1970, brown coal used for this purpose totaled 80.4 million tons and hard coal 36.4 million tons; total electric energy produced was 226,919 gigawatt-hours, with coal and lignite accounting for 64 percent.

Brown coal mining operations in West Germany were reviewed from a standpoint of environmental damage and restoration of the land.[8] Operations in 1970 required the excavation of some 243 million cubic yards of spoil which was transported to workedout mines for fill. Overburden at surface mining operations presently is as much as 550 feet when mining coal from beds 50 to 350 feet thick. Most of the land disturbed by these operations has been or will be restored. The cost of restoring them to full agricultural productivity ranges from $3,000 to $4,000 per acre.

Petroleum and Natural Gas.—Crude oil production totaled 7.4 million tons in 1971, about 1.5 percent less than 1970 output. Remaining reserves, proven and probable totaled 75.5 million tons, according to the West German Petroleum Producers' Association. Well production of crude has been decreasing and was expected to be about 4.5 million tons in 1976. The country's consumption continued to be the largest in Western Europe, accounting for 126.6 million tons, an increase of 3.7 percent over that of 1970.

Refinery output of finished products slightly higher than that of 1970, was as follows:

Product	1970	1971
Refinery, heating and town gas	[1] 4,626,776	[1] 4,828,625
Ethylene, propylene, butadiene, and butylene	1,039,162	965,035
Other LPGs	1,501,982	1,623,188
Motor gasoline	13,024,202	13,305,669
Naphtha and spirit	4,898,909	4,781,177
Kerosine and jet fuel	1,241,827	1,289,854
Diesel oil	9,709,364	9,336,713
Fuel oil, light	[1] 27,384,693	[1] 29,755,887
Lubricating oil, grease	1,054,842	987,365
Fuel oil, heavy	[1] 33,295,697	[1] 32,081,378
Paraffin, wax	135,167	135,868
Bitumen	4,704,471	4,703,707
Petroleum coke	[1] 609,425	650,234
Sulfur	61,983	65,832
Other products	1,277,929	1,080,370
Total	104,566,429	105,590,902

[1] Includes refineries' own consumption.

Refinery throughput capacities rose to 125 million tons in 1971, and crude actually processed during the year totaled 106.6 million tons. The output of 105.6 million tons of refined oil fractions was increased by blending in 5.55 million tons of finished and semifinished products from outside sources, plus 0.26 million tons of additives, giving an overall refinery total of 111.4 million tons, or 1.4 million tons above that of 1970.

Crude oil received by refineries from foreign sources totaled 99.2 million tons. Of this, 81.7 percent came in via pipeline, and 18.3 percent was discharged by ocean tankers directly to plants at ports or transferred by small tankers and rail tank cars to inland plants. The West German tanker fleet was estimated to be capable of supplying approximately 30 percent of the Nation's transport requirements. Crude oil imports totaled 100.2 million tons and were distributed by country of origin as follows in thousand tons:

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[8] Nephew, E. A. Healing Wounds. Environment, v. 14, No. 1, January 1972, pp. 12–21.

Country	1970	1971
Libya	40,922	29,940
Saudi Arabia	12,058	16,845
Algeria	7,984	11,327
Nigeria	6,945	9,511
Iran	8,269	8,517
Abu Dhabi	5,764	5,861
Kuwait	3,953	4,299
Iraq	3,478	4,168
U.S.S.R	3,437	3,318
Venezuela	3,402	2,838
Tunisia	836	1,254
Qatar	308	952
Egypt	1,276	738
Syria	--	300
Gabon	157	283
Norway	--	78
Total[1]	98,786	100,230

[1] Data may not add to totals shown because of independent rounding.

In addition to the crude oil, imports of finished products amounted to 32.3 million tons, exclusive of about 60,000 tons of gasoline and motor oil additives. Light fuel oil comprised over one-half of the finished products. West Germany exported a total of 8.4 million tons of petroleum products including 4.9 million tons of fuel oil, 1.4 million tons of naphtha, and 0.7 million tons of gasoline.

Production of natural gas increased in 1971 to 14,789 million cubic meters, 23.5 percent above that of 1970. Another 576 million cubic meters was obtained as a by-product from oilfield operations. West Germany's reserves were estimated at 280,000 million cubic meters proven and 107,000 million cubic meters probable. The total is equivalent to 310 million tons of oil in energy value. Fuel experts predicted that West Germany's consumption of natural gas, as a source of energy would more than double by 1980.

Rheinisch-Westfälisches Elektrizitätswerk A.G. secured a provisional contract for purchase of 1 billion cubic meters of natural gas per year from the Drente fields in the Netherlands; delivery would start at the end of 1973 to supply a new powerplant at Hüntel, across the border from the gasfields. The Netherlands supplied a total of 5,900 million cubic feet to West Germany in 1971. The U.S.S.R. is scheduled to start natural gas deliveries to West Germany in 1973, which will reach 7,000 million cubic meters per year under present contracts.

The Federal Republic planned to build up a national crude oil reserve of 10 million tons by 1975 at a cost of over $150 million. Specially prepared salt caverns would be used to store the oil, which would be sufficient for about 25 days. Normally a 60 to 75 day stock is maintained. The "Kavernen Bau-und Betriebsgesellshaft mbH" (KBB; Cavern Construction and Operating Co.) in Hanover was founded by Preussag A.G. and Salzgitter A.G. in May to carry out a program for storage of petroleum. Edeleanu G.m.b.H., a subsidiary of Deutsche Texaco A.G., was constructing three crude oil caverns in the Heide salt dome of Schleswig-Holstein near its refinery. Initial capacity is to be 344,000 tons with the caverns to be filled by the end of 1973. A second construction phase was planned to increase this capacity by 172,000 tons. The Organization for Economic Cooperation and Development (OECD) nations are committed by treaty to help each other in event of an oil emergency.

West Germany's liberal investment policies for foreign oil companies following World War II resulted in the country's oil being largely controlled by international producers; German firms control about 37 percent 'of the domestic output. The only West German-owned company with direct access to crude oil in appreciable quantity is Gelsenberg A.G. It holds a 35-percent concession in Libya with Mobil Oil Corp., yielding about 4 million tons per year. Other West German-owned companies extract an additional 3 to 4 million tons from their own sources.

Wells drilled by type in 1971 were wildcat, 27; extension, 9; and production, 26. Of these wells 33 were successful, nine yielding oil and 24 natural gas. Total well depth drilled amounted to 173,379 meters.

Several West German groups, including the national oil search consortium, Deminex, were awarded new oil and gas exploration licenses by the U.K. Government in the British sector of the North Sea. Other successful West German bidders included the firms Th. Weisser and Lingden offshore in the Ball-Collins consortium and the Badische Anilin and Soda Fabrik A.G. subsidiary of Wintershall in the Pennzoil Consortium. Deminex also has exploration ventures offshore of Jordan, Trinidad, Indonesia, Guyana, and Nigeria, and onshore in Canada. Licenses cover over 160,000 square kilometers. Total budget for the consortium for the period 1970 to 1974 was over $200 million, about 75 percent of which was funded by the Federal Government and the remaining 25 percent by shareholding companies.

Agreement in principle was concluded with British Petroleum (BP) to buy into the BP concession in offshore Abu Dhabi. If this agreement is finalized, it would give West Germany immediate access to this Middle East crude oil holding, which is estimated to amount to reserves of about 2,000 million tons of crude. Deminex would obtain about 12.5 million tons per year over a 20-year period. An agreement signed December 16, 1971, with representatives of the Nigerian Government granted Deminex concession rights in four blocks of the shelf area off the Niger estuary. An extension of the permit held by the German North Sea consortium to explore and produce oil and natural gas in the West German area of the North Sea was granted until 1975 by the Clausthal Mining Authorities.

A number of refinery expansions and construction projects were underway. These projects were expected to raise total crude capacity to 134 million tons by the end of 1972 and possibly to 215 million tons by the end of 1975. Pipelines were being laid from the French port of Fos to Karlsruhe and from Wilhelmshaven to the Rhine-Ruhr area to transport the additional supply. These pipelines were to be parallel to existing lines. The port of Wilhelmshaven was opened to 200,000 deadweight-ton tankers in December, and construction of a new pipeline from this port to Hamburg was being considered. A large percentage of the West German refineries have plans for expansion by 1975, and several new plants are scheduled. Deutsche Texaco A.G. decided to increasse the crude oil capacity of its Heide refinery by 1.8 million tons per year by 1973. Deutsche Shell scheduled a 9-million-ton-per-year refinery near Worms to be in operation by 1978. Mobil Oil and the Government were considering construction of a new refinery at Wilhelmshaven to cost over $200 million. West Berlin officials also were considering construction of a refinery, which would be supplied with crude oil from the U.S.S.R. via pipeline from Schwedt in East Germany. Environmental problems have delayed construction of at least one refinery, a project of VEBA Chemie and Deutsche Shell scheduled to be erected at Orsoy on the lower Rhine river.

Average crude oil prices, c.i.f. frontier, were about DM16.50 higher in 1971,

Table 11.—Federal Republic of Germany: Petroleum and natural gas production by area

Area	1969	1970	1971
PETROLEUM (THOUSAND TONS)			
North German basin:			
North of Elbe (Schleswig-Holstein)	883	800	799
Between Elbe and Weser	2,360	2,247	2,184
Between Weser and Ems	1,954	1,891	1,942
Ems Estuary	--	2	2
West of Ems (Emsland)	2,092	2,002	1,941
Upper Rhine Valley	189	199	198
Alpine Foreland (Bavaria)	398	393	353
Total	7,876	[1] 7,535	[1] 7,420
NATURAL GAS (MILLION CUBIC METERS)			
Between Elbe and Weser (Hannover)	62	69	74
Between Weser and Ems (Hannover)	4,336	5,906	7,186
Ems Estuary	2,050	3,611	4,614
West of Ems (Emsland)	883	1,280	1,598
Upper Rhine Valley	34	26	25
Alpine Foreland (Bavaria)	823	1,084	1,292
Total	[1] 8,187	[1] 11,977	14,789

[1] Data may not add to totals shown because of independent rounding.

chiefly as a result of the Tehran and Tripoli agreements. Value of combined turnover in crude oil and natural gas nationwide accounted for 3.9 percent of West Germany's 1971 industrial turnover of DM566 billion.

Table 12.—Federal Republic of Germany: Shipments of petroleum products
(Thousand metric tons)

Commodity	1969	1970	1971
Domestic sales:			
Gasoline, all kinds	18,213	19,548	21,783
Kerosine, including turbofuel	1,421	1,781	1,892
Diesel oil	8,744	9,640	9,712
Fuel oils	61,892	69,983	72,467
Liquefied petroleum gas	2,035	2,208	2,329
Lube oil and greases	976	1,087	1,092
Petroleum coke	543	973	603
Bitumen	4,397	4,730	4,661
Refinery gases	2,593	2,571	2,402
Other products	1,270	2,040	1,592
Total	[1] 102,083	[r] 114,556	118,533
Consumption by refineries:			
Fuel oil	4,271	4,544	4,175
Refinery gas	2,390	2,896	3,266
Petroleum coke	212	230	238
Total	[1] 6,874	[1] 7,671	7,679
Bunker deliveries:			
Gas and diesel oil	880	846	794
Fuel oil	3,146	2,882	2,932
Lubricants	37	44	16
Total	4,063	[1] 3,773	3,742
Exports	7,478	8,453	8,374
Other shipments	1,451	1,624	1,628
Changes in refinery stock	+399	+335	+394
Balancing factor [2]	−273	+656	+270
Total products available [1]	122,075	[r] 137,068	140,620

[r] Revised.
[1] Data may not add to totals shown because of independent rounding.
[2] Apparently, changes in nonrefinery stocks.

The Mineral Industry of Ghana

By Henry E. Stipp [1]

The Government of Ghana made a number of proposals concerning the mineral industry in 1971. It recommended developing bauxite deposits at Kibi and Nyinahin, establishing an integrated aluminum industry in Ghana, developing limestone deposits at Nauli, and establishing Government commissions to oversee the aluminum and petroleum industries. These steps were recommended as one way to provide new jobs, and solve the major problem of unemployment.

A loan agreement for $1.2 million [2] was negotiated between the Ghanaian and Canadian Governments. The loan was to cover costs of a 2-year aerial topographic survey of a 24,000-square-mile area of western Ghana that reportedly contains gold and diamond deposits. Maps on a scale of 1:50,000 will be made, and a natural resources inventory will be conducted, based upon map information.

The Canadian International Development Agency was scheduled to finance a program for developing a school of mines that will be located at Tarkwa.[3] According to the agreement signed by the two countries, Canada will supply three geology and mining engineering specialists and provide scholarships for training Ghanaians in Canada.

In July the Government raised purchase and sales taxes on petroleum products. The Government also passed a national development tax of 5 percent of chargeable income and a service payments allocation tax of 25 percent of profits remitted out of Ghana.

In August the Ghanaian Government appointed an aluminum industry commission to study proposals for developing the country's bauxite deposits.

The Government of Ghana in collaboration with a U.S.S.R. geological group was mapping an area around Shieni in the Northern Region, near the Togo border.

A Commission of Inquiry, appointed by the Government to investigate strike activity at the Obuasi mine of Ashanti Goldfields Corp. Ltd., determined that the strike was illegal. The Commission found that police were justified in opening fire on workers, but recommended that some police officials be disciplined for indiscriminate shooting. It was recommended also that the wounded and families of those killed be compensated.

A fund for the educational and scientific benefit of the Ghanaian people was established by the Volta Aluminum Co. Ltd. (VALCO).[4] The fund could be used also to carry out charitable, social, and development projects. VALCO paid $300,000 into the fund and pledged to pay a minimum of $100,000 per year.

PRODUCTION

Several mining organizations were studying the economic feasibility of developing Ghana's bauxite deposits; prospects for the increased production of bauxite and its conversion to alumina in a domestic plant were considered to be good. Gold production decreased 1 percent in 1971 to 698,000 troy ounces, compared with 708,000 troy ounces in 1970. Gold output has been hampered during the last 2 years by strikes and work stoppages; however, future production should increase, owing to discovery of new deposits and additional mine development. The value of mineral commodities (excluding petroleum products) produced in 1971 were estimated at $133.7 million, compared with an estimated $120.6 million in 1970. Figures on mineral production are shown in table 1.

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[1] Physical scientist, Division of Ferrous Metals.

[2] Where necessary, values have been converted from Ghanaian currency to U.S. dollars at the rate of 1 new Ghana cedi=US$0.98.

[3] Barclays Overseas Review (London). June 1971, p. 19.

[4] American Metal Market. Aluminum. V. 78, No. 206, Oct. 27, 1971, p. 9.

Table 1.—Ghana: Production of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971 [p]
METALS			
Aluminum:			
Bauxite	[r] 245,783	349,724	329,608
Metal, smelter production	113,109	113,039	111,125
Gold thousand troy ounces	707	708	698
Iron and steel semimanufactures [e]	7,360	NA	NA
Manganese ore and concentrate	332,756	390,976	598,562
Silver troy ounces	2,649	--	--
NONMETALS			
Cement	407,513	422,487	[e] 445,000
Diamond:			
Gem [e] thousand carats	239	255	256
Industrial [e] do	2,152	2,295	2,306
Total do	2,391	2,550	2,562
Salt	35,923	16,123	47,261
MINERAL FUELS AND RELATED MATERIALS			
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	1,353	1,349	1,684
Jet fuel do	--	--	166
Kerosine do	474	550	601
Distillate fuel oil do	1,613	1,819	1,985
Residual fuel oil do	2,305	1,982	2,165
Other do	37	50	69
Refinery fuel and losses do	300	200	294
Total do	6,082	5,950	6,964

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the listed commodities, a variety of crude construction materials is undoubtedly produced for local use, but no data on such production are available.

TRADE

Export duties on minerals produced in Ghana were raised from 1 to 10 percent in July as a result of the increasing deficit in the trade balance and a precarious financial situation resulting from excess borrowing by previous administrations. Import surcharges on many items also were raised.

An export bonus plan was proposed to the National Assembly, whereby some exporters would receive a bonus of 25 percent of export earnings, during fiscal years 1971 and 1972. However, exports of aluminum, manganese, diamonds, gold, and several other major commodities would be excluded from the plan, unless they were exported to other African countries.

The Governments of Ghana and the United States concluded an agreement for a $15.0 million loan to finance imports of U.S. merchandise into Ghana. The loan is repayable over a 40-year period with a moratorium of 10 years.

Figures on imports and exports of mineral commodities are shown in tables 2 and 3.

Table 2.—Ghana: Exports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum:			
Bauxite and concentrate	287,968	339,099	United Kingdom 298,684; Netherlands 16,246.
Metal including alloys, unwrought	126,090	99,067	United Kingdom 36,161; Netherlands 21,676; Japan 12,932.
Gold, bullion ______ thousand troy ounces	713	22,421	All to United Kingdom.
Iron and steel:			
Ore and concentrate	611	--	
Metal:			
Scrap	2,486	--	
Ferromanganese	--	3,475	All to Spain.
Semimanufactures	607	370	Mainly to Nigeria.
Manganese ore and concentrate	329,401	403,345	Norway 120,934; United States 95,033; Spain 47,739.
Silver and platinum ores	--	47	All to United Kingdom.
Other, nonferrous metal scrap n.e.s	716	2,722	United Kingdom 1,850; Italy 667.
NONMETALS			
Clay products, refractory	--	2	All to United Kingdom.
Diamond, all grades ____ thousand carats	2,477	2,872	Mainly to United Kingdom.
MINERAL FUELS AND RELATED MATERIALS			
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	(1)	(1)	All to Nigeria.
Refinery products, residual fuel oil do	1,821	619	NA.

NA Not available.

(1) Less than ½ unit.

Source: External Trade Statistics of Ghana, 1969, v. 19, No. 12; and 1970, v. 20, No. 12.

Table 3.—Ghana: Imports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum:		
Oxide and hydroxide	209,781	217,689
Metal:		
Unwrought	168	797
Semimanufactures	2,019	2,264
Copper, metal including alloys, all forms	614	739
Gold, including alloys, all forms ... troy ounces	--	--
Iron and steel:		
Scrap	2,069	4,798
Pig iron, ferroalloys, etc	501	2,008
Steel, primary forms	415	179
Semimanufactures	36,937	51,487
Lead, metal including alloys, all forms	274	164
Magnesium and beryllium, metal, all forms	5,521	45
Nickel, metal	(1)	2
Silver, platinum-group metals ... troy ounces	--	10,769
Tin, metal, all forms ... long tons	250	225
Zinc, metal, all forms	1,992	959
Other, n.e.s.:		
Ores and concentrate	13	9
Scrap	36	--
Metal including alloys	62	261
NONMETALS		
Abrasives, natural:		
Pumice, emery, natural corundum	17	5
Grinding and polishing wheels and stones	354	556
Asbestos	56	51
Cement:		
Clinker	395,145	389,409
Portland	5,124	2,474
Chalk	33	25
Clays and products (including refractory):		
Clays n.e.s	1,300	1,732
Products	7,520	6,936
Diatomite and other infusorial earths ... value, thousands	$30	$43
Fertilizer materials:		
Crude	616	2,808
Manufactured	6,235	5,269
Ammonia	99	88
Graphite, natural	--	172
Gypsum and plasters	18,961	12,058
Lime	3,167	3,062
Salt and brines	1,628	2,571
Sodium and potassium compounds, caustic soda	4,406	7,408
Stone, sand and gravel	1,167	980
Sulfur:		
Sulfur and unroasted iron pyrites	90	1
Sulfuric acid	902	1,438
Talc, steatite and pyrophyllite	368	1,010
Other [2]	780	102
MINERAL FUELS AND RELATED MATERIALS		
Asphalt, natural	75	101
Coal and coke including briquets ... thousand tons	18	32
Petroleum:		
Crude and partly refined ... thousand 42-gallon barrels	5,467	5,178
Refinery products:		
Gasoline ... do	16	6
Kerosine and jet fuel ... do	332	250
Distillate fuel oil ... do	(1)	19
Lubricants ... do	111	136
Gas, natural and manufactured ... value, thousands	$3	$64
Mineral jelly and wax ... thousand 42-gallon barrels	25	17
Other ... do	310	338
Mineral tar and other coal, petroleum, or gas derived crude chemicals ... value, thousands	$33	$80

[1] Less than ½ unit.

[2] Includes mica, meerschaum, amber, jet.

COMMODITY REVIEW

METALS

Aluminum.—VALCO was completing installation of a fourth potline at its Tema aluminum smelter. When completed the plant will have a production capacity of 145,000 tons per year of aluminum ingot.

Bauxite.—In July the Government issued a letter of intent for a prospecting license to a consortium headed by Engineers International Corp. (Ghana) Ltd.[5] The letter gave the consortium 12 months to prospect the Nyinahin deposit in the Ashanti Region and produce a feasibility and viability report on development of the deposit and construction of a plant to produce alumina.

In June the Aluminum Resources Development Co. (ARDECO), a Japanese consortium, gave the Government of Ghana a feasibility report based upon a study of several bauxite deposits, conducted from January through March 1971. It was reported that the Japanese group offered to develop the bauxite deposits in partnership with a group headed by Kaiser Aluminum & Chemical Corp. of the United States. Earlier in the year, VALCO was given a letter of intent to prospect the Kibi bauxite deposit in the Eastern Region. VALCO was also considering construction of a plant to provide alumina for its smelter at Tema. According to a report, Kaiser agreed to a Government proposal that an alumina plant constructed in Ghana should have an initial production capacity of 600,000 tons per year, rising subsequently to 1 million tons per year.[6] Mitsui Aluminum Industry Co., Ltd. of Japan, which has been competing with Kaiser for permission to exploit Ghana's bauxite deposits, favored shipping the bauxite to Japan for processing.

Beryllium.—The Minister of Lands and Mineral Resources announced that beryl had been discovered in the Central Region.[7] Reportedly the Government was encouraging mining companies to prospect the area and exploit deposits of the beryl.

Gold.—Substantial new deposits of gold were discovered by the Prestea Gold Mine, a subsidiary of the State Gold Mining Corp. The new gold stratum is located near Kotukrom, about 13 miles from Prestea. Numerous occurrences of gold have been located in the northern section of Ghana.[8] Quartz veins containing gold occur at Dokrupe-Lovi, Lobi-Diapoli and near the village of Banda-Nkwanta in Brong-Ahafo Region. Other outcrops containing gold have been reported near Dokrupe, Northern Region and near Obuasi, Ashanti Region.

Iron Ore.—Deposits estimated to contain about 230 million tons of high grade ore were discovered near Bawku, northeastern Ghana.[9] The Government planned to reactivate the Nagodi mine, located near the Bawku iron ore discovery. At yearend the Ghanaian Geological Survey reported the discovery of about 100 million tons of ore containing from 30 to 50 percent iron, located at Shieni, 100 miles east of Tamale.[10] Other preliminary iron ore occurrences have been located near Shieni, Kubalem, Kave, Gbongbon, Blinkpale, and Kilinga.

Manganese.—Three types of occurrences were reported near Yakau-Himakrom, 20 miles west of Takoradi, Western Region. Eluvial and detrital deposits have been investigated, and ore has been found in a few boreholes. However, the ore is low grade and would have to be beneficiated to make ferromanganese.

Mercury.—Prospecting was being carried out in the Tromia and Nsuansa valleys, Brong-Ahafo Region.

NONMETALS

Asbestos.—The National Investment Bank of Ghana and a West German organization, the Fulgrit Group, reportedly were financing a $3.6 million asbestos sheet factory, which would be built at Tema.

Cement.—Ghana Cement Works Ltd. was studying the feasibility of exporting cement to nearby African countries. The company's Tema and Takoradi plants have production capacities of 200,000 and 500,000 tons per year, respectively. Cement consumption in Ghana was estimated at about 600,000 tons per year. The manufacture of cement blocks will be restricted to Ghanians only under the Ghanaian (Promotion) Act of 1970. Pfeiffer Spun Concrete Products (Ghana) Ltd., a joint venture between Ghana's National Investment Bank and Pfeiffer of West Germany, was selected to produce and supply concrete pipe for the Accra to Tema sewer project.

Clays.—A $2.9 million ceramics factory was expected to be completed at Saltpond in July.[11] The factory, a joint project of Agrob Anlagenoau (G.m.b.H) of West

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[5] Standard Bank (London). Annual Economic Review, Ghana. October 1971, p. 9.

[6] Metals Week. Ghana Studies Bauxite Plants. V. 42, No. 31, Aug. 2, 1971, p. 6.

[7] Barclays Overseas Review (London). June 1971, p. 19.

[8] Mining Journal. Ghana. V. 277, No. 7108, Nov. 12, 1971, p. 431.

[9] Engineering and Mining Journal. In Africa. V. 171, No. 11, November 1970, p. 356.

[10] Work cited in footnote 7.

[11] Barclays Overseas Review (London). May 1971, p. 18.

Germany and the National Investment Bank of Ghana, will produce wall tile and sanitary ware.

Diamond.—Consolidated African Section Trust Ltd. (CAST) produced 2,426,000 carats in the year ended June 30, 1971, compared with 2,424,000 in fiscal 1970.[12] Sales of diamond in fiscal 1971 were valued at $11.76 million, compared with $12.13 million in the previous year. Prices for diamond on the world market continued to decrease, especially for certain types of Ghanaian stones.

Limestone.—The Government received several proposals for exploiting the 400-million-ton deposit of limestone at Nauli in the Western Region.[13] Cost of developing the deposit and constructing a harbor near Nauli was estimated at $10.8 million. Limestone would be shipped to Takoradi and Tema to be processed into cement, according to one proposal.

Salt.—The $11.8 million salt recovery plant, scheduled for construction at Sengor, Eastern Region, was to be in operation before yearend 1971.[14]

MINERAL FUELS

Petroleum.—In November the Ghanaian Parliament passed a bill establishing a commission to regulate and supervise all activities of the petroleum industry in Ghana. The commission also will draft and enforce safety and conservation regulations.

Signal Oil and Gas Co. drilled an exploratory well about 2 miles offshore from Cape Coast. The well was dry and abandoned at yearend. So far Signal has drilled a total of six wells in 1970 and 1971; however, of those only one has located significant quantities of crude oil. Texaco Africa Ltd. drilled a dry hole for Oceanic Exploration group in the middle of its concession, which adjoins Signal's concession on the eastern border. At yearend Texaco was preparing to drill another exploration well. Shell Oil Co. completed its aerial magnetic survey of the Volta basin. Results of the survey were not disclosed.

Negotiations were conducted between the Government and Ghana-Italian Petroleum Co. (GHAIP), whereby the Government would obtain up to 50 percent of GHAIP share capital.[15]

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[12] Consolidated African Selection Trust Ltd. (London). Annual Report, 1971. P. 5.

[13] Work cited in footnote 4.

[14] Barclays Overseas Review (London). September 1971, p. 16.

[15] Standard Bank Review (London). October 1971, p. 13.

The Mineral Industry of Greece

By John D. Corrick [1]

Greece's strong economic growth in 1969 and 1970 continued through 1971. The Nation recorded a 7.6-percent increase in its gross national product (GNP). Substantial increases in invisible earnings (tourism), power generation, mining and construction, as well as an expansionary budget contributed to the growth. Greece's low birth rate helped the Nation avoid chronic unemployment and permitted the per capita GNP to grow from $378 in 1960 to $1,000 in 1971. Indications were that far-reaching structural reforms initiated by the Government were working. Improvements in the Greek mineral industry were evidenced by increased production of cement, ferronickel, aluminum, and the establishment of new mining facilities. The net industrial output, which expanded by 11.3 percent in 1969 and 10.9 percent in 1970, increased by more than 9 percent in 1971. Domestic prices remained relatively stable throughout 1971 as evidenced by the average consumer price index, which rose just over 3 percent. The Government's ability to control inflation was traceable, in part, to establishment of Greece's Price Control Committee in July 1971.

During 1971, the Greek Government authorized $102 million [2] in new foreign investments, $13.6 million came from the United States. However, many authorized projects failed to materialize. Notable among these were construction of a third refinery or expansion of existing refineries and construction of an aluminum smelter, both holdovers from the aborted Greek Government-Onassis agreement of 1970. Among other projects that failed to materialize although authorized by the Government were (1) a $200 million project by the Greek ship owner, Niarchos, which included a lubricating oil refinery and a possible steel mill, a dead-burned magnesite plant, and a refractory materials or magnesium metal plant; (2) a proposed $160 million petrochemical complex by the Greek ship owner, Vardinoyannis; and (3) an additional alumina plant utilizing extensive Greek reserves of bauxite.

PRODUCTION

Many segments of the Greek mineral industry made appreciable gains in 1971. Notable among these were increased production of alumina (49 percent), aluminum (33 percent), bauxite (35 percent), nickeliferous iron ore (34 percent), and zinc concentrates (46 percent). Decreased production occurred in chromium ores (6 percent), iron pyrites (23 percent), and manganese ore (7 percent). Significant increases in the production of nonmetal minerals were recorded in crude barite (34 percent), processed barite (83 percent), crude magnesite (20 percent), and dead-burned magnesite (22 percent), while decreases were recorded in production of caustic calcined magnesite (27 percent), crude perlite (5 percent), and pumice (11 percent). The development of new lignite fields to feed thermoelectric powerstations resulted in lignite production increasing 40 percent in 1971 over that of 1970.

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[1] Physical scientist, Division of Ferrous Metals.

[2] Where necessary, values have been converted from Greek Drachma (Dr) to U.S. dollars at a rate of G Drl = US$0.0333.

Table 1.—Greece: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity[1]	1969	1970	1971[p]
METALS			
Aluminum:			
Bauxite, gross weight ... thousand tons	1,948	2,292	3,088
Alumina ... do	287	313	467
Metal, primary	83,153	87,481	116,066
Chromium, chromite concentrates, gross weight	60,610	56,782	53,131
Iron and steel:			
Iron ore and concentrates	--	873	--
Pig iron and blast furnace ferroalloys[2]	290,000	300,000	291,633
Ferroalloys, electric furnace, ferronickel	18,473	NA	NA
Crude steel[2]	450,000	435,000	476,572
Steel semimanufactures[2]	450,000	400,000	719,721
Lead:			
Mine output, metal content	8,665	9,227	10,469
Smelter, primary (refined)	10,700	14,342	11,714
Manganese ore and concentrate, gross weight	6,464	6,590	6,127
Nickel:			
Mine output, metal content[e]	5,820	9,100	10,500
Metal, electrolytic	74	--	NA
Silver, smelter or refinery output ... thousand troy ounces	258	420	462
Zinc, mine output, metal content	9,188	9,367	13,664
NONMETALS			
Abrasives, natural, emery	7,100	7,000	7,000
Barite, concentrates	83,141	54,091	98,865
Cement, hydraulic ... thousand tons	4,840	4,900	5,546
Clays:			
Bentonite:			
Crude	206,861	192,941	--
Processed	2,979	10,542	--
Kaolin	61,405	48,274	53,966
Fertilizers, manufactured, gross weight:			
Nitrogenous ... thousand tons	293	379	353
Phosphatic ... do	648	617	642
Gypsum and anhydrite	271,654	308,553	330,000
Magnesite:			
Crude	570,725	755,176	902,708
Dead burned	168,518	219,866	267,882
Caustic calcined	51,114	57,338	42,019
Perlite, crude	148,616	168,508	160,614
Pumice	375,231	450,774	398,990
Pyrite:			
Gross weight	245,529	270,341	207,343
Sulfur content	114,000	117,600	93,140
Salt, all types ... thousand tons	75	70	[e]70
Stone, dimension, marble ... cubic meters	57,000	59,000	62,000
Talc	6,074	2,744	1,855
MINERAL FUELS AND RELATED MATERIALS			
Coal, lignite ... thousand tons	[r]6,735	7,858	10,975
Coke, gashouse ... do	14	15	--
Fuel, briquets (lignite briquets) ... do	90	81	88
Gas, manufactured ... million cubic feet	343	388	388
Petroleum refinery products:			
Gasoline ... thousand 42-gallon barrels	4,420	4,947	5,542
Jet fuel ... do	2,624	2,424	2,952
Kerosine ... do	721	775	581
Distillate fuel oil ... do	10,698	12,227	12,749
Residual fuel oil ... do	10,643	11,668	12,940
Lubricants ... do	126	119	112
Other ... do	2,707	3,327	3,083
Refinery fuel and losses ... do	1,731	1,503	1,504
Total ... do	33,670	36,990	39,463

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed cobalt and a variety of crude construction materials such as clays sand, and gravel, and stone, are produced but output is unreported and available information is inadequate to make reliable estimates of output levels. Cobalt production is as a byproduct of iron-nickel ore processing.

[2] Erroneously reported as tons rather than thousand tons in previous chapter.

TRADE

Greece's balance of payments deteriorated further in 1971. Growing demand for consumer and capital goods and higher petroleum costs pushed imports up 11 percent whereas exports grew only 3 percent. However, a sharp rise in invisible earnings (tourism) in 1971 helped offset the widening trade gap. Some metals for export, especially nickel, were withheld from the market because of a sharp drop in metal prices in world markets. Whereas exports of industrial products, chemicals, and textiles continued to grow at a fast rate. During 1970, exports of mineral commodities showing increases were lead ore and concentrate (18 percent), zinc ore and concentrate (26 percent), and magnesite (26 percent).

Large capital inflows, mostly supplier credits and private deposits, prompted a dramatic rise in 1971's foreign exchange reserves. At yearend, official assets of gold and convertible foreign exchange were at an all-time high of $503 million. The relationship between mineral trade and total commodity trade in recent years follows:

	Value (million dollars)	
	Mineral commodity trade	Total commodity trade
Exports:		
1968	90.0	467.8
1969	110.0	553.6
1970	184.3	642.5
Imports:		
1968	218.3	1,393.2
1969	270.9	1,594.2
1970	310.8	1,958.3

Table 2.—Greece: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum:			
Bauxite and concentrate thousand tons	1,309	1,235	U.S.S.R. 615; West Germany 181; France 87; Netherlands 83.
Oxide and hydroxide do	119	170	United States 62; Italy 38; Poland 38; Yugoslavia 23.
Metal, including alloys:			
Unwrought	67,670	60,012	Italy 20,673; Belgium-Luxembourg 19,780; France 11,845.
Semimanufactures	5,804	9,277	Italy 5,352; Yugoslavia 1,600; Portugal 467; Cyprus 289.
Chromite	25,862	24,976	West Germany 17,115; Norway 7,861.
Copper:			
Metal, including alloys:			
Scrap	NA	152	Spain 80.
Semimanufactures	1,479	1,493	France 658; West Germany 410; United States 137.
Iron and steel:			
Roasted pyrite	59,235	74,841	West Germany 41,397.
Steel, primary forms	59,338	19,147	Netherlands 8,308; United Kingdom 3,224.
Semimanufactures:			
Universals, plates, and sheets	123,471	131,936	Yugoslavia 94,856; Bulgaria 31,143; Romania 3,348.
Tubes, pipes, and fittings	2,058	1,980	Cyprus 1,132; Libya 416.
Lead, ore and concentrate	11,618	13,750	Italy 7,750; France 4,000; West Germany 2,000.
Manganese, ore and concentrate	5,017	4,004	West Germany 2,640.
Nickel, metal, including alloys, all forms	261	--	
Silver, metal, including alloys value, thousands	NA	$172	France $172.
Zinc, ore and concentrate	17,095	21,612	France 11,120; Italy 9,242.
Other, ash and residues containing nonferrous metals	1,831	2,333	Belgium-Luxembourg 1,646; Spain 415.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	214,251	237,734	United States 228,820.
Cement	618,302	371,165	Libya 270,266; Yugoslavia 35,278; Italy 32,226.
Clays and products:			
Crude clays, n.e.s	156,771	157,867	Canada 50,515; France 30,040; Nigeria 17,711; Libya 15,045.
Products:			
Refractory (including nonclay bricks)	NA	79	West Germany 64.
Nonrefractory	2,630	3,537	Cyprus 756; West Germany 448.

See footnote at end of table.

Table 2.—Greece: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
NONMETALS—Continued			
Fertilizer materials, manufactured:			
Phosphatic	NA	43,601	Bulgaria 43,601.
Other	29,839	72,393	Italy 27,190; India 24,893; Bulgaria 16,871.
Magnesite	235,721	296,940	West Germany 90,970; United States 89,161; United Kingdom 36,920.
Stone, sand and gravel:			
Dimension stone, crude and partly worked	28,430	32,993	Italy 12,749; West Germany 10,495; Netherlands 5,269.
Sulfur, elemental	25,076	9,542	Arab Republic of Egypt 4,000; Romania 3,810.
Other nonmetals, crude	106,035	126,134	France 48,520; United Kingdom 30,881; West Germany 26,770.
MINERAL FUELS AND RELATED MATERIALS			
Petroleum refinery products:			
Gasoline, including natural thousand 42-gallon barrels	166	152	Cyprus 142.
Kerosine and jet fuel do	971	1,233	Lebanon 535; Switzerland 164; Cyprus 138; United States 117.
Distillate fuel oil do	647	371	West Germany 189; Cyprus 137.
Residual fuel oil do	233	358	Cyprus 106; France 86; Italy 52.

NA Not available.

Table 3.—Greece: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum metal, including alloys:		
Unwrought	1,053	454
Semimanufactures	2,539	1,817
Copper metal including alloys:		
Unwrought	9,931	11,791
Semimanufactures	454	556
Iron and steel:		
Ore and concentrate	471,084	552,732
Metal:		
Pig iron including cast iron	26,119	22,397
Ferroalloys	3,522	4,686
Steel, primary forms thousand tons	176	136
Semimanufactures:		
Bars, rods, angles, shapes, sections do	201	212
Universals, plates, and sheets do	122	130
Hoop and strip do	35	24
Rails and accessories do	1	4
Wire do	9	11
Tubes, pipes, fittings do	18	19
Castings and forgings do	1	2
Lead:		
Ore and concentrate	14,717	16,362
Oxides	217	165
Metal, including alloys:		
Unwrought	4,783	8,530
Semimanufactures	NA	121
Mercury 76-pound flasks	261	87
Nickel, metal, including alloys, all forms	47	63
Platinum-group metals and silver, including alloys:		
Platinum group value, thousands	$32	$67
Silver do	$533	$734
Tin, metal, including alloys, all forms long tons	195	197
Titanium oxides	3,183	3,565
Tungsten metal, including alloys, all forms value, thousands	$140	$213
Zinc, metal, including alloys:		
Unwrought	10,763	8,315
Semimanufactures	230	437
Other base metals,[1] including alloys, all forms	56	48

See footnote at end of table.

Table 3.—Greece: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970
NONMETALS		
Abrasives, natural, n.e.s.: Grinding stones	239	321
Asbestos	11,614	17,811
Cement	1,159	1,334
Clays and products (including refractory brick):		
Crude, refractory	r34,259	54,350
Products:		
Refractory (including nonclay bricks)	24,540	55,654
Nonrefractory	4,044	6,429
Diatomite and other infusorial earths	1,343	1,051
Feldspar and fluorspar	2,498	3,498
Fertilizer materials:		
Crude phosphatic thousand tons	319	179
Manufactured:		
Nitrogenous do	115	74
Potassic do	32	23
Other, including mixed do	2	3
Ammonia do	8	13
Magnesite	688	875
Pigments, mineral, including processed iron oxide	1,102	1,190
Pyrite (gross weight)	26,380	12,971
Salt and brines	47,483	57,959
Sodium and potassium compounds, n.e.s	21,780	14,505
Stone, sand and gravel:		
Dimension stone	114	1,074
Dolomite, chiefly refractory grade	1,686	862
Sand, excluding metal bearing	47,160	76,933
Sulfur:		
Elemental, all forms	144,792	43,986
Sulfuric acid, oleum	9,839	NA
Talc, steatite, soapstone and pyrophyllite	1,947	3,915
Other nonmetals, n.e.s.: Building materials of asphalt, asbestos and fiber, cement and unfired nonmetals, n.e.s	2,974	1,051
MINERAL FUELS AND RELATED MATERIALS		
Carbon black	1,987	1,851
Coal and coke, including briquets thousand tons	370	448
Gas, hydrocarbon	20,632	13,481
Petroleum:		
Crude and partly refined thousand 42-gallon barrels	33,991	36,989
Refinery products:		
Gasoline, including natural do	613	786
Kerosine and jet fuel do	65	686
Distillate fuel oil do	2,523	2,140
Residual fuel oil do	6,128	5,545
Lubricants do	390	544
Other do	258	253

rRevised. NA Not available.

COMMODITY REVIEW

METALS

Aluminum.—Bauxite mine operators continued extensive exploration and improvements to their mining facilities in order to provide increased supplies of ore for an expanding domestic alumina-aluminum industry. Production of bauxite in Greece increased from 2.3 million tons in 1970 to 3.1 million tons in 1971. The Greek Minister of National Economy announced in 1971 that recent prospecting of lands in Greece had proven large additional bauxite deposits which could easily support three aluminum smelters. The Eliopoulos Brothers group reportedly found a 100-million-ton reserve in its concession area. Officials of Parnassos Bauxite, S.A., a member of the Eliopoulos group, which produced approximately 60 percent of the domestic bauxite, stated that its output of bauxite could be raised 2 million tons within a 3-year period. Bauxite presently being mined by the company assays 57 to 59 percent Al_2O_3, 18 to 22 percent iron, 4 percent minimum SiO_2, and less than 1 percent calcium oxide. Parnassos obtained approval from the Greek Government to expand its operations. The project called for investment of $6.3 million to prospect for and mine bauxite in the unexplored areas of Parnassos and Ghiona and construct a concentrating plant in the area. The project would increase present bauxite output from 0.9 million tons per year to 1.5 million tons per year in the first stage and to 2 million tons at a later date. Known Greek reserves of bauxite were estimated at 84 million tons with 100 million tons probable.

The Greek Ministry of Commerce lowered the bauxite export quota from 1.376 million tons in 1970 to 1.295 million tons in 1971. Export quotas for bauxite in 1971 by country of destination were European Economic Community (EEC)—420,000 tons; U.S.S.R.—450,000 tons; Great Britain—125,000 tons; United States—75,000 tons; Japan—20,000 tons; Czechoslovakia—50,000 tons; Sweden—55,000 tons; and Spain—60,000 tons.

Greece's alumina and aluminum output came from the St. Nicolas smelter of Aluminium de Grèce, S.A. (ADG). Early in 1971, the nominal capacity of the St. Nicolas smelter was increased to 150,000 tons. However, the recession in the aluminum market during 1971 made it necessary to defer the startup of some of the furnaces, thereby limiting the year's production to 116,000 tons. Production of alumina was 467,000 tons in 1971, against 313,000 tons in 1970.

Greek aluminum consumption in 1971 was estimated at 21,000 tons, approximately 8,000 tons less than the previous year. Reduced consumption was due to a heavy reduction in sales of fabricated products for export. Greek fabricators ran into unexpected difficulties when they tried to export their products. Viohalco Aluminum, S.A., was expanding the capacity of its aluminum semifabricating plant near Athens in order to raise output 5 tons per 8-hour shift.

The Greek Government announced in 1971 abandonment of the $600 million investment package deal, ratified early in 1970 with Aristotle Onassis, calling for establishment of a major integrated aluminum complex in Greece. Deputy Prime Minister Makerezos announced a compromise settlement whereby Onassis was to turn over to the Hellenic Industrial Development Bank (ETVA) his shares of "Omega" Industrial Investment Corp. worth approximately $1 million, and deliver to the Government feasibility reports made for Omega which were estimated to be worth $3 million. In exchange, the Government would release without prejudice Onassis' $7 million performance bond. At yearend the Government, divested of the Onassis agreement, was considering proposals from Aluminum Co. of America (Alcoa), Reynolds Metals Co., and Kaiser Aluminum and Chemical Corp. of the United States for establishment of an alumina-aluminum plant in Greece. Late in the year, the Greek Government and Alcoa announced agreement in principle. The agreement was expected to be concluded in the early part of 1972. The plant's initial annual capacity was estimated at 300,000 tons of alumina and 150,000 tons of aluminum. Construction costs were estimated at $300 million. Reliable sources reported Alcoa would obtain a favorable power rate, comparable to ADG's 4.375 mills per kilowatt hour. The proposed plant probably will be located between the ports of Galaxidi and Naupactus on the north coast of the Gulf of Corinth. In connection with the proposed plant, Alcoa reportedly was negotiating with Helicon Bauxite of the G. L. Barlos Co. for rights to their 45- to 50-million-ton reserve of bauxite.

Reynolds International's joint plans with Parnassos to invest $100 million in an alumina plant with an initial annual capacity of about 250,000 tons may be jeopardized by the Government's acceptance of Alcoa's plans. At yearend, the Reynolds plan was being evaluated by the Greek Government. Also being evaluated by the Government at yearend was a plan from the Niarchos group and Kaiser Aluminum and Chemical Corp. of the United States to establish a 60,000-ton-per-year aluminum plant in Greece. Establishment of a third smelter will depend on availability of Greek bauxite reserves.

Copper.—The Ermioni mines of the Hellenic Chemical Products and Fertilizer Co., part of the Podossakis group, reportedly were producing 50,000 tons of copper pyrite per year (3 percent copper). The ore was processed locally to make fertilizer and sulfuric acid. The copper was shipped to West Germany. A new mine was opened in 1971, approximately one-half mile from the main mine. Plans called for the mine to be 600 meters in length with branching galleries. The Ermioni mines are a relatively small operation. The lifespan of known reserves was estimated at 20 years. Test drilling was underway during the year to find additional copper. Péchiney reportedly was taking over exploitation of the Chalkidike Peninsula copper deposits from the Noranda group's Placer Development.

Iron and Steel.—Company officials of Hellenic Steel Co., Inc., announced that they had reached technical agreement with the Japanese firms, Nippon Kokan K. K. and C. Itoh Co., Ltd., for expansion of Hellenic's steelworks at Thessaloniki. The Japanese firms were to prepare a feasibility study for expansion of the works. Also discussed was an equity participation and arrangement whereby the Japanese would undertake international marketing of Hellenic's products. According to Hellenic officials, the tentative expansion was to be completed by 1975 at a cost of $150 million and would employ 1,500 people compared with 600 presently employed. The expansion plans were under consideration for approval by the Government at yearend.

The Greek Government authorized Anninos Vlassis to import steel and equipment worth $3.8 million for construction of new works at Platamon. Total cost of the project was estimated at $7 million. The plant's designed capacity will be 60,000 tons per year of merchant bars, of which 40 percent will be exported. The plant will process either scrap or sponge iron.

The Ministry of Industry also authorized establishment of two other small steel mills. One mill costing $5.8 million was to be at Stilis on the eastern coast of central Greece and would be operated by Metallourgiki Athinon S.A. A second $2 million steel mill was to be in the Patras area and would be operated by Patraiki Halyvourgia S.A. Both plants will have electric arc furnaces and will use scrap iron, pellets, and cinder as raw materials.

Halyvourgia Voriou (formerly Viohalco Sanitas, S.A.) started a three-strand continuous casting machine at its Salonica works in 1971. According to the company, this machine was part of their plan to increase raw steel capacity to 200,000 tons per year. A second 35- to 40-ton-per-day-capacity electric arc furnace was to be commissioned in December 1971.

The Government appointed a committee to examine the Greek steel industry. The committee was to review legislation relating to imports of steel products and submit recommendations on new incentives to stimulate future investments in the steel industry.

Nickel.—Nickel ore production in Greece increased 34 percent in 1971 over 1970. Production during the past 3 years had risen from 501,409 tons in 1969 to 882,693 tons in 1970 and 1,182,000 tons in 1971. The Société Minière et Métallurgique de Larymna S.A. (LARCO) smelter at Larymna produced ferronickel with a nickel content of 10,680 tons, compared with 8,642 tons in 1970. LARCO's exports of ferronickel, which totaled 7,210 tons nickel content in 1970, were nearly stopped in 1971 as a result of market conditions throughout the world. Nevertheless, LARCO continued its planned expansion program. In April, the company obtained Government approval to invest $16 million in its mines and processing plant at Larymna and mines at Psachna. Improvements to facilities at Psachna included installation of a 1.5 million ton ore grinding mill, a rotary kiln, and ore loading and port facilities. LARCO expected to increase annual production capacity to between 15,000 and 18,000 tons of nickel when these projects are completed. LARCO established a company, Mining of Northern Greece S.A., in April to engage in nickel prospecting and development. Moreover, LARCO concluded a cooperative agreement with Société Générale des Minerais (SGM) of Brussels for the sale of LARCO's ferronickel on world markets. The agreement called for the formation of a new company to be located in Brussels and capitalized equally by LARCO and SGM.

LARCO treated ore from the original mine at Agios Ioannis, 12 kilometers from Larymna, which was an underground operation yielding nickeliferous iron ore containing an average of 1.32 percent nickel. Future mine development was to be concentrated on the company's properties at Psachna on the Island of Euboea. Three hundred thousand tons of ore averaging 1.1 percent nickel were mined by open pit methods during 1970. Because of lower mining costs associated with open pit mining, the Psachna mines supplied the major tonnage of ore mined in 1971 with lesser amounts coming from the Agios Ioannis mine. LARCO's proven reserves of nickel-bearing laterite ore amounted to some 30 million tons, with an additional 40 million tons of probable ore.

Other significant nickel developments during 1971 included the reported decision of Elevsís Bauxite S.A. to exploit nickel laterite deposits on Euboea. Mineral research carried out by private interests and State agencies during 1971 proved deposits of nickeliferous ore at Kalabaka, Pella, and on Euboea. Greek deposits of nickeliferous ore were estimated at 100 million tons. Intercontinental Mining and Abrasives Inc. (ICON) of New York, in a joint venture with the Australian company, Southland Mining Ltd., reportedly applied to the Ministry of Coordination for approval of a $30 to $50 million investment in nickel mining and manufacturing in Greece. Planned capacity of the nickel plant would be 10,000 tons of contained nickel as ferronickel. At yearend, ICON announced it had completed a preliminary agreement with Airco Alloys Carbide Co. for the construction of a ferronickel plant near Athens. This was the second of two proposed refineries by ICON. This plant was scheduled for completion by early 1974 with an expected annual production capacity of 6,000 tons of contained nickel. ICON held leases on nickel-bearing properties near the Yugoslavian border and was reportedly in the early exploration stages at this site. Preliminary findings indicated a potential for chrome, manganese, and other materials including nickel. ICON also reported locating nickel-bearing ore in an area west of Thessaloniki. Meanwhile, the Scalistiris group was reportedly proceeding with plans to establish a nickel plant in northern Euboea for the production of pure nickel metal through a chemical process. The cost of the proposed plant was estimated at $50 million with completion scheduled for 1975. The Scalistiris group conducted an exploratory search for nickel and claimed to have outlined 50 million tons in proven reserves, 80 million tons in probable reserves, and 200 million tons in possible reserves.

Uranium.—Following approval by the United Nations of an uranium exploration program for eastern Macedonia and Thrace, a joint work team of Greek and foreign geologists was established in April 1971 to carry out prospecting, surveying, and mapping. The team was to complete its work in 18 months. The project was expected to provide basic data related to the number, extent, and broad significance of uranium and other radioactive occurrences in this area and enable the Greek Government to plan its subsequent mineral development program.

NONMETALS

Asbestos.—Following an agreement in 1970 between the U.S. Cerro Corp. and the local firm Hellenic Asbestos Mining and Industrial Corp. to mine Greece's only known asbestos deposits at Zindanion near Kozani, northern Greece; a new corporation was formed, Asbestos Mines of Northern Greece Mining S.A. (MABEM). MABEM had $550,000 of capital and was controlled by Cerro (90 percent) and ETVA (10 percent). In March 1971, MABEM completed a pilot plant at a cost of approximately $550,000. The plant was built by Kilborn Engineering of Toronto, Canada, and had a designed capacity for treating 100 tons of ore per day. Samples of chrysotile fibers were sent to laboratories in Canada, England, and Belgium for testing. The tests were designed to determine the quality of the asbestos fibers and the production level at which the proposed mine could operate. If test results prove satisfactory, MABEM will put the Zindanion mines into commercial production and establish a fiber plant with an annual production capacity of 40,000 to 45,000 tons. Total cost of the plant was estimated at $16 to $17 million, with completion scheduled for 2½ years from the start of construction. Approximately one-half of the plant's output was to be consumed locally by manufacturers of asbestos-cement products. The remainder was to be shipped to Eastern Europe, Turkey, Lebanon, Syria, and the southwest Pacific. The Zindanion asbestos deposit was estimated to contain 50 million tons and with the exception of asbestos deposits near Milan, Italy, and an undeveloped low-grade deposit in Cyprus, the Zindanion mine was the only asbestos mine in the Mediterranean area.

Cement.—The Greek cement industry planned to increase in 1972 total annual production capacity of cement plants to 8 million tons. Titan Cement Co. commissioned a third unit at its cement plant at Elevsís in the fall of 1971. The new unit was estimated to have cost $8.3 million and had a production capacity of 450,000 tons per year. The new plant would increase the total annual production capacity to 1 million tons. During 1971, the company inaugurated a cement distribution station at Alexandroúpolis and had a second station under construction at Herákleion, Crete. The company also purchased two ships to facilitate transportation of its output. When the company's expansion program is completed, production is expected to reach 3 million tons per year.

In May 1971, Chalkis Cement Co., S.A. obtained Government approval for a $14.7 million expansion of its plant at Avlis, near Chalkis. The new unit to be completed in 1975 will raise the company's production capacity from the current 660,000 tons to 1.1 million tons per year. Equipment was to be supplied by French and West German firms.

The Hellenic Cement Co., formerly owned by Titan Cement Co. (55 percent) and the American Cement Corp. of the United States (45 percent), became all Greek-owned in March 1971 when Titan bought out American. Titan's development plans called for an investment of an additional $6 million for a second kiln. Halyps S.A. was planning a $1.7 million expansion and modernization of its plant at Skaramanga by 1973. The company was reportedly negotiating with a German firm for crushers.

Fertilizers and Fertilizer Materials.—Hellenic Chemical Products and Fertilizers Co., Ltd., contracted the construction of a new ammonium phosphate-based complex fertilizer plant to Coppee-Rust S.A. of Belgium. The new plant was to be built at Drapetsona, Piraeus, and cost $2 million. Production capacity was rated at 750 tons per day. Construction was to start in 1971 and was to be completed by the end of 1972. Fertilizers already produced in the Drapetsona complex include ammonium phosphate and sulfate, single superphosphate, and around 135,000 tons per year of complex fertilizers. A new 200,000-ton-per-year sulfuric acid plant was being constructed in the area by Krebs and was to be commissioned early in 1972.

Magnesite.—Increased world demand for magnesite, as well as the high quality of Greek magnesite, has resulted in important developments in this Greek industry over the past several years. Production of Greek magnesite showed no indications of slowing in 1971. Greece produced 902,708 tons of crude magnesite, 42,019 tons of caustic calcined magnesite, and 267,382 tons of dead-burned magnesite in 1971; the respective figures for 1970 were 755,176 tons, 57,338 tons, and 219,366 tons.

The Société Financière de Grèce, S.A. (SFG) (a Scalistiris group company), one of the largest producers of dead-burned magnesite in the world, with a yearly production of approximately 140,000 tons in 1970, reportedly produced 210,000 tons in 1971. The company operated two dressing plants and four rotary kilns on Euboea Island. An affiliated company, Macedonian Magnesite S.A. had under construction in Ormylia (Chalkidiki) a magnesite dressing plant with an annual capacity of 120,000 tons of dressed ore and a rotary kiln for dead-burned magnesite with an annual capacity of 40,000 tons. The company also had under construction at Mantoudi (Euboea) another rotary kiln with an annual capacity of 70,000 tons. Both kilns were expected to be producing magnesite by the middle of 1972. Total magnesite production by the Scalistiris group would then be 250,000 tons by 1972 and 320,000 tons by 1973. The company also had under construction a new plant for the production of refractory bricks and expected to have it operational by the middle of 1972. The plant was designed to produce 40,000 annual tons of fire-tar-impregnated and tar-bonded bricks of high quality for use in lining basic oxygen furnaces, cement kilns, and for vessels used in the glass industry.

An agreement between the Greek Pyrite Mining Co., Hellenic Chemical Products and Fertilizer Co., and D. P. Papastratis and Co. was expected to expand magnesite production on Euboea. Papastratis held rights to extensive magnesite deposits on the Island of Euboea through its subsidiary, Mining, Trading, and Manufacturing Ltd. The Papastratis group had supplied a high-quality caustic calcined magnesite suitable for production of fused magnesia refractories in the past; however, the company is presently expanding its production of dead-burned magnesite. As a result of the strong demand for refractory magnesite, Papastratis was constructing a rotary kiln capable of producing 50,000 tons per year of low-iron, dead-burned magnesite. A new dressing plant employing heavy media separation was to be built and mining operations were to be extended in order to provide suitable feed for the kiln.

Although magnesite production on the Island of Euboea had received a major portion of attention recently, the Chalkidiki Peninsula was still of considerable importance to the Greek magnesite mining industry. During 1971, the Grecian Magnesite Co. brought into operation a new 50,000-ton-per-year-capacity rotary kiln for production of dead-burned magnesite at its plant at Yerakini in the Chalkidiki area. The kiln was supplied by the West German company, Polysius A.G. A new grinding and treatment plant also was commissioned during the year. Other companies producing calcined magnesite in Greece during the year were Magnomin S.A., a subsidiary of OEAMAG—the Austro-American Magnesite Co. and Macedonian Magnesite S.A., an affiliate of SFG.

MINERAL FUELS

Lignite and Peat.—Demand for lignite in Greece continued to increase in 1971. The increase was a direct result of increased electrification of the country, as 76 percent of the lignite consumed went for the production of electricity. Production of raw lignite in 1971 totaled 10,975,000 tons, a 40-percent increase over that of 1970. Principal reason for Greece being able to increase production of lignite was because the country's largest open pit lignite mine at Ptolemaís increased its production capacity from 2 million to 6 million annual tons in 1971. The increased production at Ptolemaís resulted from the installation of large continuous excavators and a high-capacity belt-conveyor system. The mine was operated by Ptolemaís Mining and Industrial Co., Ltd. (LIPTOL), a subsidiary of the State-owned Electricity Commission (DEI). LIPTOL's minable coal reserves were estimated at 350 million tons in 1962. Two grades of lignite were mined: grade A, suitable for briqueting, having a maximum ash content of 9 percent in the wet condition, and grade B, suitable for boiler firing, with up to 13 percent ash content. The mine overburden thickness varies from 0 to 150 feet and the lignite seam thickness fluctuates around 160 feet, increasing in the northern regions to a maximum thickness of 210 feet. The Ptolemaís plant is centrally controlled and monitored by a control station provided with a mosaic illuminated indicator panel with signal devices, indicators for belt weigher readings, and remote recorders for car weigher readings. The efficiency of the continuous mining method, using bucket wheel excavators for mining and belt conveyors for transporting, was demonstrated by the fact that the targeted capacity for lignite handling has been exceeded by 30 percent.

During 1971, an agreement was signed between the Public Power Corp. (PPC) and a foreign consortium for the construction of a third lignite-fired 300-megawatt power station at Megalopolis. The agreement called for the unit to become operational in March 1975. Installation of this unit will necessitate the opening of a new coalfield at Thoknia, in the Megalopolis area, as well as a field at Choremi. The new unit was designed to consume some 5 million tons per year of lignite and produce 2,000 million kilowatt hours of energy. Cost, including extensions to the coalfields, were estimated at $115 million. The PPC also signed a contract with the French firm, Constructions Électriques and Méchaniques Alsthom for the supply and installation of a second 300-megawatt lignite-fired powerplant at the newly developed Kardia coalfield in the Ptolemaís area. The cost of the second unit was estimated at $58 million, including civil engineering works of $8 million. This project was to be partly financed by two French banks which will make available $35.5 million repayable in 10 years at 7-percent interest. The unit was scheduled to go into commercial operation in April 1975.

An agreement was signed late in 1971 between the PPC and the Soviet corporation, Energomas Export, for the construction of two power-generating stations at Philippi utilizing local peat deposits. The Philippi plan specified two power stations with a capacity of 125,000 megawatts each. In addition to the powerplant, there will be a dam at the convergence of the Drama and Angittis rivers, a water purification plant, a pumping station, and a railway line or conveyor belt to transport the peat. Peat will be mined by opencast methods to a depth of 11 meters. Test drilling showed peat deposits extending to a depth of 70 meters. Sufficient reserves were estimated to provide the electric generating facilities with a life span of 25 years. The installation will necessitate importation from the U.S.S.R. of approximately 100,000 tons of steel and 25,000 tons of machinery. Remaining equipment and machinery will be supplied by local sources.

Officials of PPC stated that electric power production in 1971 totaled 10.6 billion kilowatt hours compared with 9 billion in 1970, an increase of approximately 18 percent. Installed power-generating capacity was increased from 2,500,000 kilowatts to 2,667,000 kilowatts, or 7 percent over that of the previous year. PPC stated its long term objective was to reduce dependence of the national electrification grid on oil-fired powerplants. To this end, emphasis was to be given the development of the country's own power resources of lignite, peat, and water.

Petroleum.—Greek petroleum exploration continued the momentum started in 1970. Since September 1968, eight United States firms have signed 14 exploration contracts with the Greek Government involving commitments to spend $71,125,000 on oil rerearch. While seismic and other preparatory work was underway with some contracts, only Texaco (Overseas Petroleum Co.) undertook a drilling program. The Davis Oil Corp. International S.A. of Geneva, Switzerland, a corporation controlled by Davis Oil Co. of Denver, Colo., and Petro-Search Co. of Delaware concluded two oil exploration and development agreements in 1971 with the Greek Government. These agreements provided for onshore and offshore petroleum exploration in (1) a 2,000-square-kilometer area at Rhodes and (2) a 3,200-square-kilometer area at Kyparissia, western Peloponnesus. Total investments under these two agreements were placed at $12.4 million over a 5-year period. Another company, Anschutz Overseas Corp. of Denver, Colo., also concluded an oil exploration and development agreement in 1971 with the Greek Government providing for petroleum exploration in an area of about 2,400 square kilometers on the Kassándra Peninsula in waters of Kassándra Gulf, Chalkidiki, northern Greece. Total costs under the agreement were placed at $3.2 million to be invested over a period of 5 years. Under the provisions of the agreement, Anschutz was to conduct seismological, geological, and geophysical research as well as drillings to a minimum depth of 2,615 meters.

Although termination of the agreement between the Greek Government and Onassis for establishment of a refinery in Greece dealt a severe blow to the Government's plans in this area, progress was made. Greece's two oil refineries, the Esso-Pappas refinery in Thessaloniki and the Greek-owned refinery at Aspropyrgos, processed a total of 5,337,000 tons of crude in 1971 against 5,031,000 tons in 1970 and 4,568,000 tons in 1969. Esso-Pappas completed improvements to its Thessaloniki refinery and increased annual processing capacity from 2.5 million tons to 3.2 million tons in 1971. Work was also underway on modernizing the Aspropyrgos refinery and expanding its annual processing capacity from 1,850,000 to 4,500,000 tons. This project was part of Stavros Niarchos' $2 million investment plan and was scheduled to be completed by May 30, 1972. Early in 1971, Greek shipowner John Latsis obtained the Government's approval to establish a 1-million-ton-per-year crude petroleum refinery at Elevsís, near Athens. The output of the Latsis refinery, scheduled for completion late in 1971, will be entirely for export. The new Latsis refinery will operate on Arabian crude using a new refining method.

Motor Oil (Hellas) S.A., owned by Greek shipowner Nicholas Vardinoyannis, had under construction a 75,000-ton-per-year-capacity lubricating oil refinery near Corinth. Motor Oil signed an agreement in 1971 to obtain its crude petroleum requirements from Shell Oil Co. In exchange, Shell will obtain its requirements for lubricating oil for the Greek market and for bunkering oil at Greek ports. Motor Oil obtained Government approval to expand its $17 million lubricating oil refinery to a $30 million facility, and will produce annually (1) 75,000 tons of lubricating oil; (2) 300,000 tons of heavy fuel oil; (3) 100,000 tons of marine diesel oil; (4) 310,000 tons of gas oil; and (5) 350,000 tons of naphtha. The project was to be completed by August 1972. Motor Oil also announced plans to establish a $160 million petrochemical complex in association with the French firm, Société Chimique des Chardonnages. The French firm was to prepare the studies, design and supervise construction of the project, provide technical assistance and know-how, and handle marketing. The plant would produce ethylene—300,000 tons; propylene—100,000 tons; butadiene—30,000 to 40,000 tons; gasoline (by steam cracking)—120,000 to 140,000 tons; polyvinyl chloride—50,000 tons; polyethylene (low density)—60,000 tons; polyethelene (high density)—60,000 tons; polypropylene—30,000 tons; polyacrilonitril—45,000 tons; styrol—90,000 tons; and fuels—50,000 tons. Motor Oil proposed to obtain raw materials for its petrochemical complex from its lubricating oil, fuel oil, and naphtha refinery presently under construction at Aghioi Theodoroi near Athens.

A new $2.5 million corporation, Hellenic Lubricating Oil Co. S.A., was established to own and operate a lubricating oil refinery costing $25 million. Capitalization for the company was contributed by the General Investments Co. ($250,000) and by the Reagent Investment Corp. Co., Inc., of Liberia ($2,250,000).

The Mineral Industry of Hungary

By Joseph B. Huvos[1]

Hungary produced only a few minerals in 1971. Of these minerals, only bauxite was important by world standards with output representing about 4 percent of the world's estimated total. Mineral fuels and iron and steel produced were important only for Hungary's domestic economy. Large-scale imports were needed to satisfy the expanding demand for most mineral commodities, except bauxite and low-rank coals.

Hungary's total gross national product (GNP) in 1971 was estimated at 294.1 billion forints,[2] an increase of 7 to 8 percent over 1970.[3] Investments in 1971 totaled 100 billion forints, an increase of 10 percent, at comparable prices, over the 1970 level.

In 1971 planned production and fulfillment of these goals in the minerals and related industries were as follows, in percent of 1970 figures:[4]

Industry sector	Plan	Fulfillment
Mining	101.0	97.5
Energy industry	107.8	106.7
Metallurgy	103.8	104.5
Chemical industry	109.0	110.9
Average	106.0	104.3

Among the many new and modernized industrial plants commissioned during the year were a bitumen plant at the Duna petroleum industry works and a new lime plant at the Duna cement and lime works. The wide strip mill of the light metal works and foundry unit were commissioned at the Székesfehérvár light metal works, and, in Selyp, an asbestos-cement-pipe plant was also commissioned. Construction continued on numerous plants in the iron and steel, mineral fuels, and fertilizer materials industries.

PRODUCTION

Production of coal, Hungary's most important domestic mineral commodity, decreased slightly in 1971, with output of brown and bituminous coal decreasing and lignite production increasing. This was according to the plan for rationalizing the coal mining industry and utilizing Hungary's lignite resources for generating power.

Production of bauxite, Hungary's most important export mineral, increased only slightly because substantial investments in this area did not yet bear fruit.

Nitrogenous and phosphatic fertilizer production continued to increase substantially. Iron ore and iron and steel production continued to increase at a steady, moderate rate. Cement production decreased slightly, but the production of other building materials increased. Production of crude petroleum increased slightly; natural gas production increased substantially.

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[1] Foreign mineral specialist, Division of Fossil Fuels.

[2] Values have not been converted from Hungarian currency units Forints (Fts) to U.S. dollars owing to the wide variation between the official exchange rate Fts11.78=US$1.00 and those actually used for some transactions.

[3] Népszabadság, Budapest. Központi Statisztikai Hivatal Jelentése (Report of the Central Office for Statistics). V. 30, No. 25.

[4] Work cited in footnote 3.

Table 1.—Hungary: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1969	1970	1971 [p]
METALS			
Aluminum:			
Bauxite thousand tons	[r] 1,934	2,022	2,090
Alumina do	408	441	467
Metal including secondary	64,463	66,029	67,037
Copper:			
Mine output, metal content [e]	1,000	1,000	1,200
Metal:			
Smelter, primary	1,000	1,000	1,200
Refined, including secondary	10,900	11,200	12,000
Gold, mine output [e] troy ounces	320	320	320
Iron and steel:			
Iron ore thousand tons	681	629	687
Pig iron:			
Pig iron for steel do	1,735	1,798	1,890
Pig iron for foundries do	18	24	80
Total do	1,753	1,822	1,970
Ferroalloys do	14	9	16
Crude steel do	3,031	3,110	3,111
Steel semimanufactures, rolled only do	2,020	2,038	2,064
Lead:			
Mine output, metal content [e]	1,000	1,735	1,735
Metal, refined, secondary [e]	1,000	720	720
Manganese ore [2] thousand tons	156	169	167
Silver [e] thousand troy ounces	6	6	6
Zinc:			
Mine output, metal content [e]	4,800	4,800	4,800
Smelter, secondary	NA	740	NA
NONMETALS			
Cement, hydraulic thousand tons	[r] 2,565	2,771	2,712
Clays:			
Bentonite do	57	65	71
Kaolin, crude and washed do	60	78	65
Fertilizer materials, manufactured:			
Nitrogenous:			
Gross weight do	1,464	1,709	1,841
Nitrogen content do	800	850	877
Phosphatic:			
Gross weight do	917	900	922
Phosphorus pentoxide content do	170	167	174
Lime, calcined do	691	658	610
Perlite	NA	NA	40
Pyrite:			
Gross weight [e]	4,000	6,500	7,000
Sulfur content [e]	1,600	2,600	2,800
Refractory materials, n.e.s.:			
Chamotte products thousand tons	198	179	179
Chrome magnesite products do	48	56	55
Stone:			
Dimension, all types do	21	6	3
Other:			
Dolomite do	629	699	819
Limestone do	5,241	5,621	5,754
Quartzite do	28	14	13
Sand and gravel:			
Gravel thousand cubic meters	7,954	8,812	9,983
Sand, common do	376	354	360
Sand, moulding thousand tons	427	555	603
Sulfur:			
Elemental, byproduct	2,526	3,233	3,370
Sulfuric acid thousand tons	454	457	468
Talc	NA	16,149	16,000
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	[e] 4,000	4,151	[e] 4,200
Coal:			
Bituminous thousand tons	4,133	4,151	3,941
Brown do	19,396	19,008	17,757
Lignite do	2,969	4,671	5,726
Total do	26,498	27,830	27,424
Coke:			
Coke oven do	[r] 785	776	782
Gas coke do	431	399	378
Total do	1,216	1,175	1,160
Fuel briquets do	1,810	1,468	1,808

See footnotes at end of table.

Table 1.—Hungary: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity [1]	1969	1970	1971 [p]
MINERAL FUELS AND RELATED MATERIALS—Continued			
Gas:			
Manufactured ... million cubic feet	20,694	23,166	24,226
Natural, marketed ... do	114,242	122,506	130,946
Natural gas liquids:			
Natural gasoline ... thousand 42-gallon barrels	527	466	NA
Liquefied petroleum gas ... do	NA	854	NA
Petroleum:			
Crude:			
As reported ... thousand tons	1,754	1,937	1,955
Converted ... thousand 42-gallon barrels	13,383	14,780	14,917
Refinery products: [3]			
Gasoline, including naphtha ... do	[r] 7,115	8,415	8,874
Kerosine ... do	8	8	31
Distillate fuel oil ... do	[r] 12,451	14,532	16,337
Residual fuel oil ... do	[r] 13,820	15,158	15,611
Lubricants ... do	1,134	1,169	1,267
Liquefied petroleum gas ... do	[e] 620	690	[e] 740
Asphalt and bitumen ... do	3,072	2,836	3,218
Paraffin and petroletum ... do	206	221	249
Total ... do	38,426	43,029	46,827

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, gypsum and other crude construction materials such as common clay and sand and gravel are produced but available information is inadequate to make reliable estimates of output levels.

[2] Ore contains less than 25 percent manganese.

[3] Excludes refinery fuel and losses.

TRADE

In 1970, the reference year for this chapter's trade tables, the pattern of Hungary's foreign trade in mineral commodities did not change substantially. Main mineral industry export items, shipped mostly in increasing quantities, were bauxite, alumina, aluminum, manganese ores, and various semimanufactured products. The country continued to import most of its mineral requirements in steadily increasing quantities. Imports consisted mainly of nonferrous metals, iron ore, phosphates, potassium salts, rock salt, high-rank coal, coke, and crude oil.

In 1970, Hungary's trade in mineral and related products was as follows, in million devisa forints:

	Value
Exports:	
Mine products	172.4
Metallurgical products	1,356.5
Chemicals	169.8
Imports:	
Mine products	736.5
Metallurgical products	1,806.1
Chemicals	1,252.5

Hungary's total trade, including that in mineral commodities, was 56,607.1 million devisa forints.[5] The total trade balance for the same year was in deficit by 2,213.5 million devisa forints. Hungarys major trade partners were the Soviet Union and the other Communist countries; the following tabulation shows trade values in million devisa forints and percent of Hungary's total trade in 1970:

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[5] Devisa forints are values converted from other currencies to forints at the official Hungarian exchange rates.

	Million devisa forints	Percent of total
Exports:		
Communist bloc:		
U.S.S.R.	9,495.0	34.91
East Germany	2,561.4	9.42
Czechoslovakia	2,172.5	7.99
Poland	1,603.0	5.89
Other	1,975.5	7.26
Total	17,839.3	65.59
Non-Communist countries:		
West Germany	1,862.6	6.85
Italy	1,484.1	5.46
Other	6,010.8	22.10
Total	9,357.5	34.41
Grand total	27,196.8	100.00
Imports:		
Communist bloc:		
U.S.S.R.	9,737.9	33.11
East Germany	3,064.8	10.42
Czechoslovakia	2,323.9	7.90
Poland	1,698.1	5.77
Romania	713.7	2.43
Other	641.7	2.19
Total	18,984.2	64.55
Non-Communist countries:		
West Germany	1,502.9	5.11
Italy	1,138.8	3.87
Austria	1,146.4	3.90
Other	6,638.0	22.57
Total	10,426.1	35.45
Grand total	29,410.3	100.00

Table 2.—Hungary: Exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum:			
Bauxite[2] thousand tons	656	660	Czechoslovakia 273; East Germany 183; Poland 101; West Germany 100.
Oxides and hydroxide[2]	383,470	415,283	U.S.S.R. 200,892; Poland 134,603; Austria 50,282.
Metal and alloys:			
Scrap	9,404	2,327	Netherlands 1,839; Austria 468.
Unwrought[2]	41,050	52,579	United Kingdom 32,707; Finland 3,756.
Semimanufactures[2]	4,581	6,267	NA.
Chromium oxide and hydroxide	110	83	All to Yugoslavia.
Copper:			
Ore and concentrate	1,059	--	
Metal and alloys:			
Scrap	[r]4,890	2,109	Netherlands 1,982; Sweden 86.
Unwrought and semimanufactures	[r]1,379	2,165	Netherlands 1,383; Belgium-Luxembourg 688.
Iron and steel:[3]			
Scrap thousand tons	6	7	Mainly to West Germany.
Pig iron and ferroalloys do	18	54	Austria 8; Italy 3.
Steel, primary forms do	174	215	Austria 45; Italy 36; Switzerland 25.
Semimanufactures do	700	703	Italy 49; West Germany 47; Yugoslavia 33.
Lead:			
Ore and concentrate	4,236	--	
Metal and alloys, all forms	4,515	1,560	Netherlands 1,154; Yugoslavia 200.
Manganese, ore and concentrate	13,380	--	
Nickel metal and alloys, all forms	494	186	Sweden 104; Netherlands 82.
Platinum-group metals and silver, waste and sweepings value, thousands	$235	$118	Netherlands $85; Italy $33.
Tin metal including alloys long tons	151	--	
Titanium oxide	409	--	

See footnotes at end of table.

Table 2.—Hungary: Exports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS—Continued			
Zinc:			
Ore and concentrate	6,639	7,241	All to Poland.
Metal and alloys, all forms	199	1,821	Netherlands 1,003; United Kingdom 551.
Other:			
Ash and residues containing unspecified nonferrous metals	10,071	14,723	Austria 13,157; Netherlands 794; Belgium-Luxembourg 772.
Nonferrous metals, not further described	881	731	All to Poland.
NONMETALS			
Cement, hydraulic [2]	144,449	37,248	Yugoslavia 24,162; Czechoslovakia 11,142.
Clays and products:			
Crude, bentonite	24,226	24,824	Yugoslavia 7,390; Finland 5,279; Poland 3,931.
Products:			
Refractory, fire brick [2]	19,700	21,722	NA.
Nonrefractory	8,079	9,717	Belgium-Luxembourg 3,838; Denmark 2,767; Austria 1,265.
Diatomite and related materials	3,957	--	
Fertilizer materials, manufactured, all types [2]	140,371	67,536	NA.
Pigments, mineral, natural, crude	35	--	
Sodium compounds, n.e.s., caustic soda	2,400	14,476	Sweden 11,260; Denmark 2,511.
Stone, sand and gravel:			
Dolomite value, thousands	$29	--	
Gravel and crushed rock	71,270	--	
Limestone	24,190	23,628	Finland 19,156; Denmark 2,533.
Quartz and quartzite	3,500	--	
Sand, excluding metal-bearing	16,576	18,064	All to Austria.
Sulfur, elemental	826	2,600	Do.
Other:			
Crude nonmetals, n.e.s	7,579	[4] 18,534	Norway 6,428; Netherlands 6,154.
Slag, dross and similar waste, not bearing	9,014	--	
MINERAL FUELS AND RELATED MATERIALS			
Coal, brown [2]	154,606	91,346	NA.
Coke from bituminous coal [2]	180,117	1,202	NA.
Petroleum: Crude and partly refined thousand 42-gallon barrels	2,177	184	All to Austria.
Refinery products: [5]			
Gasoline [2] do	2,533	2,747	Belgium-Luxembourg 67.
Distillate fuel oil [2] do	1,858	[6] 1,384	NA.[6]
Residual fuel oil [2] do	3,189	1,980	Austria 410; Sweden 326; Denmark 107.
Lubricants [2] do	266	185	Austria 25; Netherlands 23.
Other:			
Mineral jelly and wax do	34	145	United Kingdom 25; Sweden 18; France 16.
Nonlubricating oils, n.e.s. do	269	1	All to Yugoslavia.
Unspecified do	365	--	
Crude chemicals from coal, oil or gas distillation	4,270	[7] 7,528	Switzerland 4,717; France 1,475.

[r] Revised. NA Not available.

[1] Compiled from official Hungarian trade returns and import data of selected trading partner countries.

[2] Official Hungarian export figure.

[3] Data from United Nations Economic Commission for Europe. Quarterly Bulletin of Steel Statistics for Europe. V. 22, No. 4, New York 1972, p. c11.

[4] Partial figure, valued at US$237,000; an additional unreported quantity, valued at US$199,000 was exported to United Kingdom.

[5] In addition to information given on destinations by individual product, Poland reportedly received approximately 1,120,000 barrels of products (distribution by product not reported).

[6] Individual trading partners reported a total of 4,178,857 barrels imported from Hungary, with Belgium-Luxembourg alone reporting 1,025,966 barrels from Hungary.

[7] Partial figure, valued at US$541,000; an additional unreported quantity valued at US$272,000 was exported to the United States and United Kingdom.

Source: Official trade returns of Hungary, Poland and the U.S.S.R., and the 1969 and 1970 editions of Statistical Office of the United Nations. Supplement to the World Trade Annual. V. 1 (East Europe) Walker and Company, New York, 1971 and 1972.

Table 3.—Hungary: Imports of selected mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum:			
Bauxite and concentrate	4,874	--	
Oxide and hydroxide [2]	29,146	20,086	United States 19,516; Yugoslavia 485.
Metal including alloys, all forms [3]	66,500	91,969	U.S.S.R. 46,700; France 1,038; Italy 260.
Chromite	72,000	13,000	All from U.S.S.R.
Copper: Metal including alloys, all forms [3]	19,105	24,722	U.S.S.R. 16,600; Israel 2,459; Belgium-Luxembourg 1,348.
Iron and steel: [4]			
Iron ore thousand tons	2,914	3,119	U.S.S.R. 2,986; India 133.
Pig iron, ferroalloys and similar materials do	245	266	U.S.S.R. 229.
Steel, primary forms do	299	347	U.S.S.R. 182; Yugoslavia 5.
Semimanufactures do	572	560	U.S.S.R. 277; Austria 37; Italy 37; West Germany 32.
Lead: [3]			
Oxide	3,824	1,672	France 1,080; Austria 417; Yugoslavia 175.
Metal including alloys, all forms	13,833	15,557	U.S.S.R. 11,100; Denmark 444; West Germany 79.
Magnesium metal, unwrought	301	300	All from U.S.S.R.
Manganese ore and concentrate	297	--	
Mercury 76-pound flasks	1,857	406	All from Spain.
Molybdenum metal including alloys, all forms	6	10	Austria 7.
Nickel metal including alloys, all forms	147	180	West Germany 82; Switzerland 49; United Kingdom 28.
Platinum-group metals, including alloys value, thousands	$342	$1,088	West Germany $910; Yugoslavia $162.
Silver metal including alloys do	$68	$754	United Kingdom $606; West Germany $75; Netherlands $58.
Tin metal including alloys [3] long tons	1,389	1,827	United Kingdom 571; Denmark 542.
Titanium oxides	1,726	2,943	Italy 2,543; West Germany 320.
Zinc:			
Oxide	1,207	922	Yugoslavia 694; United Kingdom 114; West Germany 114.
Metal, all forms [3]	20,247	17,823	U.S.S.R. 5,908.
Other:			
Ores and concentrates of ferroalloying metals [3] [5]	91,861	55,074	NA.
Metals including alloys:			
Metalloids	[6] 100	162	Italy 160.
Base metals, n.e.s	80	41	Belgium-Luxembourg 28; United Kingdom 11.
NONMETALS			
Abrasives, natural, n.e.s., grinding and polishing wheels and stones	287	325	Austria 181; West Germany 93.
Asbestos	14,695	14,118	Mainly from U.S.S.R.
Barite, witherite	18,762	14,700	Yugoslavia 13,560; West Germany 1,140.
Borates, crude, natural	5,725	--	
Cement, hydraulic [3] thousand tons	620	1,239	U.S.S.R. 459; Poland 23.
Clays and products:			
Fire [3]	91,377	76,477	NA.
Kaolin [3]	14,238	13,243	NA.
Crude, n.e.s.[3]	70,158	71,976	NA.
Products	12,433	36,838	Italy 29,184; Spain 4,956; Yugoslavia 2,698.
Diamond, gem and industrial value, thousands	$83	$351	Belgium-Luxembourg $325; West Germany $26.
Feldspar and fluorspar	6,444	5,153	Yugoslavia 2,946; Norway 1,272; Italy 935.
Fluorspar and cryolite	1,100	1,032	All from U.S.S.R.
Fertilizer materials:			
Crude phosphatic [3] thousand tons	597	604	U.S.S.R. 451; Algeria 72.
Manufactured: [3]			
Nitrogenous do	512	404	U.S.S.R. 244; Austria 120.
Phosphatic do	147	372	U.S.S.R. 291; Mexico 67.
Potassic do	457	605	U.S.S.R. 368; East Germany 235.
Ammonia	1,834	--	
Graphite, natural	1,904	1,621	U.S.S.R. 1,450; West Germany 171.
Magnesite, calcined [3]	81,349	84,377	Austria 15,871.
Mica, worked	16	16	Switzerland 11; Austria 5.
Pigments, mineral, iron oxides and hydroxides	1,035	2,515	West Germany 1,870; France 645.
Pyrite, gross weight [3] thousand tons	167	108	All from U.S.S.R.
Precious and semiprecious stones, except diamond value, thousands	$110	$131	Switzerland $110.
Sand, industrial [3]	32,417	46,931	NA.
Sodium compounds, caustic soda	51,063	42,563	West Germany 41,455; Italy 1,108.

See footnotes at end of table.

Table 3.—Hungary: Imports of selected mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
NONMETALS—Continued			
Sulfur:			
Elemental [3]	95,094	127,638	U.S.S.R. 93,000.
Sulfuric acid [3]	61,623	72,835	U.S.S.R. 57,000.
Talc and natural steatite	1,695	1,556	All from Austria.
Other nonmetals, n.e.s.:			
Crude:			
Meerschaum, amber, jet	65	--	
Other	490	897	All from West Germany.
Oxides and hydroxides of magnesium, strontium and barium	239	130	United Kingdom 78; France 52.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black [3]	5,776	7,136	U.S.S.R. 5,373.
Coal, anthracite and bituminous [3] [7] thousand tons	1,703	1,986	Poland 1,016; Czechoslovakia 579; U.S.S.R. 368.
Coal briquets [3] [7] do	283	445	All from East Germany.
Coke, all types [3] [7] do	1,173	1,254	U.S.S.R. 538; Czechoslovakia 303; Poland 277.
Gas, natural [3] million cubic feet	7,063	7,063	All from Romania.
Petroleum: Crude oil [3] thousand 42-gallon barrels	27,617	29,044	All from U.S.S.R.
Refinery products:			
Gasoline [3] do	851	895	NA.
Kerosine [3] do	854	1,050	NA.
Distillate fuel oil [3] do	1,249	2,219	U.S.S.R. 2,015.
Residual fuel oil [3] do	2,399	2,586	U.S.S.R. 2,099; Romania 394.
Lubricants [3] do	65	90	NA.
Other do	8	8	Netherlands 4.
Crude chemicals from coal, petroleum or gas distillation	17,587	15,363	U.S.S.R. 14,376; West Germany 712.

NA Not available.

[1] Compiled from official Hungarian trade returns, and from export data of selected trading partner countries.

[2] Yugoslavian import consist entirely of artificial corundum.

[3] Official Hungarian import figures.

[4] Data from United Nations Economic Commission for Europe, Quarterly Bulletin of Steel Statistics for Europe. V. 22, No. 4, New York 1972, p. c11.

[5] Figures may duplicate data on chromite and manganese ore from export statistics of trading partner countries presented elsewhere in this table.

[6] Partial figure, valued at US$33,000; an additional unreported quantity valued at $65,000 was imported mainly from Belgium-Luxembourg.

[7] Data on source countries from United Nations Economic Commission for Europe. Annual Bulletin of Coal Statistics for Europe 1971, New York 1972, p. 80.

Sources: Except where otherwise noted, official trade returns of Hungary, Poland and U.S.S.R. and Statistical Office of the United Nations. 1969 and 1970 editions of Supplement to the World Trade Annual. V. 1 (East Europe), Walker and Company, New York, 1971 and 1972.

COMMODITY REVIEW

METALS

Aluminum.—In 1971, Hungary's bauxite production increased by 3.4 percent. This will make Hungary the ninth-ranked bauxite producer, with approximately 4 percent of the world's total.

Hungarian bauxite reserves were estimated to be 80 million tons.[6]

The opening of new mines was emphasized by the Hungarian Aluminum Trust, which plans bauxite production of 2,420,000 tons in 1972, an increase of almost 16 percent. In 1972, major investments are to be made at the mines of Rákhegy No. 2, Iza No. 2, Halimba No. 2, and that of Deáki puszta,[7] the latter to start production by 1977 with a rated output of 450,000 tons per year. Beginning production in 1972 was the Halimba bauxite mine, claimed to be the largest in Europe. An output of 400,000 tons is planned for 1972, and 600,000 tons annually from 1973.

In 1971, alumina production increased 5.9 percent over 1970. The plan for 1972 is to produce 567,000 tons, an increase of more than 20 percent. At Almásfüzitö, a modernized and expanded alumina plant went onstream at yearend. In 1971, the Almásfüzitö plant's output reached 28,000 tons of alumina. A second alumina plant at Ajka, also became operational at yearend. The plant will produce 80,000 tons of alumina in 1972 and will have a capacity of 250,000 tons per year by 1975.

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[6] Le courier des pays de l'est (Parris), Metallurgie, Aluminium (Metallurgy, Aluminum) No. 145, October 1971, pp. 17–18.

[7] Népszabadság, (Budapest). V. 30, No. 8 Gyors ütemben fejlödik a népgazdaság (Rapid Development of the National Economy).

Hungarian aluminum ingot production, including secondary, was almost unchanged, with a 1.5-percent increase in 1971.

A new wide-strip rolling mill went onstream in Székesfehérvár. Costs were 2.7 billion forints during the 6 years of construction. The main unit is 1,500 by 240 feet and 65,000 tons of aluminum are going to be processed there each year.[8]

Total output of semiproducts is planned to reach 106,600 tons in 1972. The aluminum industry's total value of production in 1971 was 7 billion forints, which is to increase in 1972 to 8 billion forints (14 percent).[9]

Hungary provided 36 million forints worth of aluminum-steel cable to the People's Republic of China for use in electrification.

Copper.—Hungary imports about 30,000–31,000 tons of copper annually having almost no production of its own. Seventeen thousand tons originated in the U.S.S.R.; the rest was imported from the West.

Recently Hungary signed an agreement with Chile to import Chilean copper at a rate of 5,000 tons per year for the next 4 years, with quantities increasing after 1975.[10] Chile was given a commodity credit of US$5 million for the purchase of Hungarian machinery.[11]

According to an agreement signed during the year, GEOMINCO, the Hungarian state mining corp., will operate the Troulli copper mine situated south of Nicosia, Cyprus. The mine was previously operated by the Berdy Mining Co., owned by the Bank of Cyprus. GEOMINCO will survey unprospected areas of the mine and will spend US$2 million towards extraction of the ores.[12]

Iron and Steel.—Ferrous metallurgy in 1971 remained the most important branch of the Hungarian metals industry. Efforts continued to modernize and expand plants. In 1971, the iron and steel industry's production increased by 4.2 percent.[13] In particular, pig iron output increased by 8.1 percent in 1971, and crude steel was almost unchanged.

During 1971, 3,843,000 tons of iron ore were used, with 687,000 tons produced domestically, and the rest imported. Most of the imported iron ore was from Krivoy Rog in the Soviet Union.

It has been reported that the Rudabánya brown iron ore open pit mine will be closed in 1972 because it has become depleted. A new open pit operation has been prepared at Alsótelkes, nearby. The new mine, called Sajóbánya, has more than 500,000 tons of proven reserves.[14]

It has been learned that the second stage of the Borsod ore-dressing plant has been completed. Sinter output totals 7,000 to 8,000 tons per day on four sintering lines. Soviet iron ore concentrate, Rudabánya ore concentrate, and limonite are charged into the plant.[15]

The Ózd metallurgical works produces one-third of Hungary's rolled stock and 55 percent of its rods and shapes. A continuous steel casting plant and a continuous rod and wire rolling mill, for 5.5 to 50 millimeter round stock, were erected there. Capacity of each of the continuous operations will be 300,000 tons per year.[16] Startup is due in 1972 for the casting plant and 1974 for the mill.

The Diósgyör iron and steel works will install an oxygen plant with a capacity of 2,800 cubic meters per hour.[17]

A new continuous casting plant is being built at the Duna iron and steel works. Construction started in early 1972, with the first unit to be erected during the first quarter of 1972. The second unit follows early in 1973. Capacity will be 850,000 tons of steel per year. The value of the investment exceeds 1 billion forints.[18]

Plan targets for 1972 prescribe a 4.5-percent increase in total iron and steel production, to be realized almost totally from an increase in productivity. Pig iron is supposed to increase by 2 percent, steel by 3 percent, and rolled products by 6 percent. Increases in steel production will not however cover demand completely, and imports will still be necessary.[19] It was officially stated that, because of the increased production at the Borsod ore-dressing enterprise in 1972, it will be possible to shut down the older and less economical sintering plants at the Ózd and Lenin smelting works during the same year.[20]

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[8] Magyar Nemzet. (Budapest) Nov. 6, 1971.

[9] Work cited in footnote 12.

[10] Mining Journal (London). Chile Sells to Hungary. V. 217, No. 7111, Dec. 3, 1971, p. 514.

[11] Világgazdaság. (Budapest) Sept. 2, 1971.

[12] Mining Journal (London). Hungarian Experts for Cyprus. V. 227, No. 7090, July 9, 1971. p. 36.

[13] Work cited in footnote 3.

[14] Népszabadság (Budapest). Uj bányame Zöt tárnak fel Rudabdnyán (A new mine is being opened up at Rudabánya), Sept. 3, 1972, col. 3, p. 5.

[15] Népzabadság, (Budapest). (Naponként 7-8 ezer tonnazsugoritott érc (7-8 thousand tons of sinter per day). Apr. 2, 1972, col. 1, p. 2.

[16] Müszaki Élet (Budapest), Dr. Tibor Benyó, ch. dev. eng., Ózd Metallursical Works, Dec. 10, 1971, p. 3.

[17] Metal Bulletin (London). Oxygen for Diósgyör, No. 5598, May 11, 1972, p. 32.

[18] Népszabadság, (Budapest): Folyamatos öntömü (continuous casting), Új öntöde épül. (New foundry being built . . .). V. 29, No. 191, No. 249. Aug. 14 and Oct. 21, 1971, pp. 2-3.

Investments in Hungary's iron and steel industry for 1972 will be 2.5 billion forints. Eighty percent of this amount is to be spent for projects already in progress.[21]

Molybdenum.—Roasted molybdenum sulfide concentrates valued at $520,000, were licensed for shipment to Hungary from the United States.[22]

NONMETALS

In 1971 Hungary was essentially self-sufficient in lime, clays, kaolin, bentonite, and diatomite. A number of nonmetallic minerals, such as asbestos, cryolite, graphite, phosphate rock and concentrate, rock salt, sulfur, and pyrites had to be imported to meet most or all of the country's requirements.

Aluminum Sulfate.—At the end of 1971 an aluminum sulfate plant, a new section of the Mosonmagyaróvár alumina and alundum factory, was commissioned. Capacity was said to be 300,000 tons per year, allowing for substantial exports after satisfying domestic demand.[23]

Cement.—Hungary's cement output in 1971 decreased slightly, and 1,480,000 tons had to be imported during the year to meet demand. In the meantime, the Beremend 1-million-ton-per-year, 2.5-billion-forint plant will go partially onstream in April 1972, with one of the two oil-fired production lines.[24] Both production lines will be in operation by July 1972.

It was officially stated that, by 1975, the new Hejöscsaba cement works will be commissioned. At that time domestic production will meet 80 to 85 percent of demand. Technical problems prevailing at the Vác cement plant were solved, making it able to deliver its rated capacity of 1 million tons per year.[25]

A new asbestos cement pipe factory became operational at Selyp in July. The output of this factory, which is 100 to 150 tons per day, is equivalent to approximately 1,200 kilometers of pipe per year. There is another pipe plant in Hungary, located at the cement and lime works in Nyergesújfalú.[26]

Dolomite.—It was reported that a metallurgical-grade dolomite deposit, estimated to contain 10 million tons, has been discovered near Alsótelkes, Borsod County. Development is scheduled for the current 1971–75 5-year plan with 12 million forints allocated for this purpose.

Fertilizer Materials.—In 1971, Hungary's fertilizer output increased almost 8 percent for nitrogenous fertilizers, and phosphatic fertilizers increased 2.4 percent compared with 1970 figures. Nitrogenous fertilizer imports could be reduced from the 1969 level by 37 percent, to 250,000 tons.

It is expected that Hungary will be able to meet its entire nitrogenous fertilizer demand by the end of the current 1971–75 5-year plan. In 1974–75, consumption of all fertilizers will be 5.7 million tons. One-half of this will be nitrogenous, the remainder is one-half phosphorous and one-half potassic. Some phosphorous fertilizer will have to be imported, and all potassic material will be imported from the Soviet Union and East Germany.[27]

According to Hungarian statistics, 1 kilogram of nitrogen-phosphorus-potassium (NPK) fertilizer, costing 3 forints, produce 15 forints worth more of wheat, 25 forints more of sugar beets, and even more of fruit and grapes.[28]

Production plans of the Hungarian Chemical Industry Association for 1972 provide for a 9.5-percent increase in fertilizer over 1971. In particular, nitrogenous fertilizer production will increase by 8 percent and phosphorous fertilizer by 11 percent, showing increased demand for the latter products. Compound fertilizers will be manufactured by the Ipari Robbanóanyaggyár of Peremarton and the Pét fertilizer plant.[29]

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[19] Népszabadság, (Budapest). A Vaskodhászat 1972 évi Tervéből (From the 1972 plan of ferrous metallurgy). V. 30, No. 18. Jan. 22, 1972, p. 1.

[20] Work cited in footnote 19.

[21] Work cited in footnote 19.

[22] American Metal Market. Alloying and Precious Metals. V. 18, No. 167, Aug. 30, 1971, p. 4.

[23] Hajdu-Bihari Napló, (Debrecen) Aluminum Sulfate Plant. Nov. 4, 1971, p. 5.

[24] Népszabadság, (Budapest). Befejezés elött a BCM épitése (The Beremend Cement Plant near completion). V. 29, No. 267.

[25] Népszbadság, (Budapest) Bondor József Sajtótájékoztatója (press release if Bondor József, Minister for Building and City Development). V. 30, No. 53, Mar. 3, 1972, col. 2, p. 1.

[26] Cement, Lime, and Gravel. V. 46, No. 10, October 1971, p. 254.

[27] Tudomány és Mezögazdaság. July 1970.

[28] Figyelö. July 28, 1971.

Construction continued on several fertilizer projects. At the Pét nitrogen works, a 330,000-ton-per-year ammonia unit, licensed and engineered by Kellogg Co., a subsidiary of Pullman Inc. will go onstream in 1974. A 200,000-ton-per-day urea unit designed according to the Stamicarbon process, engineered and contracted for by Coppée-Rust S.A. of Brussels, Belgium and Gexa S.A. of France is due onstream in 1973. A 900,000-ton-per-year NPK fertilizer unit, designed according to the Norsk-Hydro process by Wellmann-Lord, Inc., (a subsidiary of Power-Gas, Stockton on Tees, England) contractors, is also under construction and is to start test runs in 1972.[30]

Hungary's phosphate rock requirements traditionally have been imported from the Soviet Union. However, increased demand in Eastern Europe made Hungary turn, in part, for the rock to North Africa. According to a bilateral barter trade agreement with Algeria, the Chemolimpex Trading Co. of Budapest will import about 300,000 tons of phosphate rock from the Djebel-Onk mine over a 3-year period. About 120,000 tons were due to be delivered in 1971.[31]

The Hungarian phosphate fertilizer industry produces predominantly single superphosphates and mixtures, no triple superphosphate or nitrophosphate are made. However at the Pét complex a nitrophosphate plant is under construction. At present, there is no phosphoric acid production in Hungary. Superphosphates are produced at Budapest, Peremarton, and Szolnok. Nitrogenous fertilizers are made at Kazinbarcika, Várpalota, and Tiszapalkonya.[32]

Perlite.—It has been reported that the Hegyalja perlite works has been modernized. As a result, its capacity will increase by 10 percent in 1972 to 50,000 tons per year.

Sulfuric Acid.—A fourth sulfuric acid plant under construction in Szolnok is due to go onstream in mid-1972. The 390-million-forint plant has a 200,000-ton-per-year monohydrate capacity and is using Polish sulfur and equipment.

MINERAL FUELS

Hungary's reliance on imported mineral fuels increased further during 1971. Although low-rank coal and lignite remained the principal source of energy for the country, natural gas and petroleum continued to increase their share of the energy market in 1971 and the share supplied by solid fuels decreased further as planned. Reportedly, under the current 5-year plan, the share of coal is to drop to 38 percent by 1975 and to 26 to 27 percent by 1980, while production remains at the 27 to 28 million ton level. The share of oil and gas will grow to cover 55 percent of Hungary's fuel requirements by 1975 and from 65 to 70 percent by 1980.

Electric power generation increased slightly to 14.99 billion kilowatt hours. Hungary is interconnected by power lines with the neighboring countries, mostly by 400 kilovolt lines. The line to Austria is of the 220-kilovolt type.[33] Hungary is a net importer of power, mainly from the Soviet Union, with 2.9 billion kilowatt hours imported in 1970. Plans for a nuclear power plant are only for 1980, when a tentative 2,000 megawatts are projected.[34] Until then, thermal plants will be used.

Coal.—In 1971, coal production decreased slightly according to the plan for rationalizing existing coal mines and to close down uneconomic units. Most of the decrease was in the production of brown coal, and there was also a slight decrease in bituminous coal. Production of lignite increased about 23 percent, probably to supply new generating units at the Visonta powerplant.

While the Visonta open pit lignite mine was further developed, work continued on construction of the last 200 megawatt unit of the powerplant that is to start to generate power by the end of 1972. When ready, the powerplant will have a capacity of 800 megawatts, with two 100-megawatt and three 200-megawatt units.

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[29] Népszabadság, (Budapest). A Vegyipar 1972. évi tervéből (from the 1972 plan of the chemical industry).

[30] Hydrocarbon Processing, (HPI construction boxscore). V. 51, No. 2. sec. 2, February 1972, p. 17., and Phosphorous and Potassium (British Sulphur Corp. Ltd.), Hungary, No. 52, March and April 1971, p. 13.

[31] Phosphorous and Potassium, No. 56, November-December 1971.

[32] Work cited in footnote 31.

[33] Energy International. V. 8, No. 6, June 1971, pp. 34–39.

[34] Work cited in footnote 33.

Brown coal production started in September 1970 near Dorog at the Lencse Mountain mine, where reserves of 30 million tons of brown coal have been found. The coal is near the surface, which makes it easy to mine.[35]

A new bituminous coal seam, 40 to 250 yards wide, has been found at Bodrogmindszent, near Pécs.

It was reported that the rate of phasing out coal mines has slowed down. Between 1965 and 1971, coal production was reduced by more than 8.5 million tons. During the next 4 years, coal mining will drop by only 2 to 2.5 million tons.

In 1970, almost 2 million tons of anthracite and bituminous coal were imported, mostly from Poland, Czechoslovakia, and the Soviet Union. Imports for 1971 amounted to 1.911 tons.

Natural Gas.—Hungary's gross natural gas production, which includes deliveries, in plant use, and amounts returned to the formation, increased by 7 percent.

Proven natural gas reserves at the end of 1970, the last year for which the information was available, were 3 trillion cubic feet, down by 9 percent from 3.3 trillion cubic feet in 1969.[36]

In 1971, the Algyö hydrocarbons deposit produced more than 1 billion cubic feet (300 million cubic meters) of natural gas. This will be tripled in 1972 to 3 billion cubic feet (900 million cubic meters). By mid-1972, a 240-million-forint, 120-million-cubic-feet-per-day gas processing plant will enter production, processing 45 billion cubic feet in 1973. An 850-million-forint gasoline separating plant will also be built through Soviet-Hungarian cooperation.[37]

Hungarian gas consumption is rising rapidly. It will reach 23 billion cubic feet (6.5 billion cubic meters) by 1975. This includes 35 billion cubic feet (1 billion cubic meters) to be imported from the Soviet Union and 0.2 billion from Romania.[38]

By yearend 1971, an agreement was signed with the Soviet Union for the construction of the "Brotherhood" gas pipeline, stretching from the Soviet Union to Hungary. The Pipeline enters Hungary at Vásárosnamény and runs through Lenin City to Budapest. Line-building equipment is from the U.S.S.R., and Hungary will manufacture the pipes.[39]

There also will be a 20-mile tieline between central Hungary and Safarikovo, Czechoslovakia, for balancing each other's gas needs.[40]

Hungary expects to have a gas pipe network of 2,650 kilometers by 1975.

Petroleum.—Crude oil output was practically unchanged in 1971 and will remain at this level for the foreseeable future. As demand increased, Hungarian imports of U.S.S.R. crude oil had to be increased by about 11 percent to 4,892,000 tons in 1971. Exploratory work was progressing in the Zala oil region and, for 1972, there are plans to drill 300,000 feet. Prospecting is planned in the vicinity of the villages of Nagyszakácsi, Németfalu, Barlahida, Bak, Pusztamagyaród, Szikla, Kecel, and Soltvadkert. Drilling will take place at Ortaháza Szánk and Tazlar. Of 26 wells drilled in the region of Ortaháza, 10 produce oil and gas and five more are expected to produce oil.

Beginning with yearend 1971, the Algyö oilfields will yield 120 million cubic feet of associated gas per day, to be used in Budapest. The Szeged oil and gas region delivered 1 million tons of crude oil and 1 billion cubic feet of gas in 1971. Three billion cubic feet of gas and 1 million tons of crude oil production are expected here in 1972.

Hungary's proven crude reserves were put at 267 million barrels in 1969, the last year for which data were available.[41]

Hungarian refining capacity was 6.8 million tons in 1970. The Százhalombatta refinery with 3.4-million-ton-per-year capacity, was still not completed and is to have over a 10-million-ton capacity after 1976. The Pét, Zalaegerszeg, and Nyirbogdány refineries were mainly for special products. Sixty percent of the products are marketed through 1,280 outlets of the AFOR, the State oil distributing company. Twenty percent of the products were exported and

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[35] Népszabadság, Budapest. Megkezdték a széntermelést . . . etc. (coal production has started. . .). V. 29, No. 231, Sept. 30, 1971, p. 3.

[36] World Oil. V. 173, No. 5, October 1971, p. 119.

[37] Népszabadság. (Budapest). V. 29, No. 306. Dec. 28, 1971.

[38] Energy International. V. 8, No. 12, December 1971, p. 39.

[39] Népszabadság. (Budapest). V. 29, No. 261. Nov. 17, 1971.

[40] Work cited in footnote 39.

[41] World Oil. V. 173, No. 5, October 1971, p. 119.

20 percent were used at the Duna power plant at Százhalombatta.[42]

It was reported that in 1971 there were 387 gasoline filling stations in Hungary. It is planned that 400 more are to be built during the 1971–75 plan period.

At the end of 1971, a new refinery was inaugurated at Szöny. The 1.3-billion-forint investment increased existing local capacities by 50 percent, to almost 2 million tons per year.[43]

The Komárom Petrochemical Co., which refined in excess of 100,000 tons per year of speciality oils for Yugoslavia, has designed, together with the Olajterv Hungarian Petroleum Industry Design Co., a refinery to be built in Novi Sad, Yugoslavia.[44]

Intensive activity in the petrochemicals field continued. At the Tisza chemical works (TVK), polyethylene production started with a 26,000-ton-per-year, U.S.S.R.-designed ethylene unit, while a 24,000-ton-per-year polyethylene plant proper was designed on the basis of ICI technology. The cost of the plants was 2.5 billion forints. Another ethylene plant, to be built by Linde of West Germany for $40 million and have a yearly capacity of 250,000 tons, will deliver surplus ethylene through a 300-kilometer pipeline to the Soviet Union.[45]

Several pipeline projects were in the news. Construction of the 1.5-billion-forint Friendship No. 2 crude pipeline is to be completed in 1972. The 24-inch pipeline runs for 188 miles on Hungarian soil. Initial capacity was said to be 6.5 million tons, to be expanded at an unspecified date to 10 million tons per year.[46]

Another new pipeline project is the trans-Yugoslavia crude oil pipeline, construction of which is to start at the beginning of 1972 and take approximately 3 years. The advantage of the pipeline is the possibility of transporting oil to Hungary and Czechoslovakia by the Sava and Danube Rivers.[47]

Some of the other pipelines under consideration were the crude line from Yugoslavia to Poland via Hungary, the Hungarian section costing 800 million forints for a 20-million-ton-per-year capacity, and a crude oil pipeline from Szeged to Százhalombatta.[48]

At the end of 1971, Hungary and the Soviet Union signed the 1972 supply contract for 5.5 million tons of crude oil at 94 million rubles.

Beginning in 1975, Iraq is to supply 5 million tons of crude oil to Hungary and Czechoslovakia in payment for credits granted by the Soviet Union.[49]

According to a Hungarian-Syrian economic pact, Hungary will receive Syrian crude in the form of a barter agreement.[50]

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[42] Petroleum Times (London), Hungarian Refining Capacity Details. V. 75, No. 1925, Nov. 5, 1971, p. 4.

[43] Népszabadság, (Budapest) Új Köolaj-feldolgozó üzemet avattak Szönyben (A new refinery was commissioned in Szöny. V. 30, No. 50, Feb. 27, 1972, p. 2.

[44] Népszabadság, (Budapest). V. 30, No. 23, Jan. 27, 1972.

[45] Köolaj és Földgáz, September to October 1968; and European Chemical News. V. 21, No. 527, Apr. 7, 1972, p. 4.

[46] Népszabadság, (Budapest). Idén elkészül a Barátság-2 Köolajvezeték (This year Friendship 2 pipeline will be ready). V. 30, No. 4, Jan. 5, 1972, p. 1; and Magyar Hirlap, Sept. 6, 1971.

[47] Petroleum Times (London), V. 75, No. 1925, Nov. 5, 1971, p. 33.

[48] Oil and Gas International. V. 11. No. 10, October 1971, p. 81; and Figyelö, Nov. 17, 1971.

[49] Financial Times, (London). Iraq to supply crude to Czechs and Hungarians, No. 25585, Oct. 22, 1971, p. 9.

[50] Magyar Nemzet. Oct. 7, 1971, p. 3.

The Mineral Industry of India

By Harold A. Taylor, Jr.,[1] and Charles W. Sweetwood [2]

The mineral industry of India was fundamentally unchanged in 1971, according to most measures. Crude mineral output was valued at $622 million [3] in 1971, compared with $609 million (revised) in 1970. The increase was almost exclusively dependent on the increase in value of petroleum from $1.45 per barrel in 1970 to $1.85 in 1971. Exports of minerals, metals, and ores were worth $377 million in 1971, compared with $416 million in 1970. Imports of minerals, metals, ores and crude petroleum were valued at $667 million in 1971, compared with $541 million (revised) in 1970.

Mining contributed less than 1.0 percent to India's gross national product (GNP) of $57.4 billion for the year ending March 31, 1972. (If mineral processing had been included along with mining, the total contribution would probably be several times mining's small share).

Detailed mine employment data for the current year (1971) are not yet available. Mineral industry employment in 1971 was about the same as it was in 1970 and in 1969, both in aggregate and broken down by category. Similarly, the Indian petroleum industry had the same employment as in 1970. It is reported that the coal mining industry lost 603,786 man-days in 1971, compared with 346,674 in 1970.

Nothing significant resulted from mineral exploration in 1971, although there was considerable interest in a platinum discovery that later proved to be insignificant. New occurrences of molybdenum, mercury, emeralds, and diamond were also announced. The amount of drilling for oil and gas was the lowest since 1962, and there were no major discoveries.

The involvement of the Government of India in mineral production and trade increased in 1971. Major nationalizations took place in coking coal and copper (early 1972), and more seem likely. On March 31, 1971, the Government's public sector investment totaled $6.3 billion for all projects in all industries, of which $2.1 billion was in the steel industry and $1.4 billion was in other metals, minerals, and petroleum.

Prospects for improvement of the transportation system were looking better in 1971 than they have for some time. In late 1971, the Government accelerated its previously-announced port facility expansion program. In addition to expanding the volume of ore (mostly iron ore) that the ports can handle, the new facilities will also allow loading of 60,000- to 70,000-ton ore carriers; presently only 30,000-ton carriers can be accommodated.

While port facilities are the greater part of the problem, the railways are most of the rest. The railways are important to the mineral industry. In 1971, they moved 87 percent of all coal, 70 percent of the iron ore, 75 percent of all petroleum and petroleum products, almost 100 percent of the manganese ore, and 71 percent of all other ores. There was less progress made in improving the railways. Rail car fabrication programs for constructing double-axle, 40-ton bogie units seemed to be going well. However, the existing multiplicity of rail gauges continued to cause inefficiency. Also the railways and the mineral industry still do not cooperate very closely.

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[1] Physical scientist, Division of Ferrous Metals.

[2] Minerals attache, U.S. Embassy, New Delhi, India.

[3] Where necessary, values have been converted from Indian Rupees (Rs) to U.S. dollars at the rate of Rs1 = US$0.133.

PRODUCTION

The following tabulation broken down by commodity group, shows an increase in value of crude mineral output from 1970 to 1971:

Commodity group	Value (million dollars)		
	1969	1970	1971
Metallic minerals:			
Ferrous	54.43	61.28	63.36
Nonferrous	19.05	20.85	23.03
Subtotal	73.48	82.13	86.39
Nonmetallic minerals [1]	[r] 80.85	83.50	85.39
Mineral fuels:			
Bituminous coal	347.84	350.57	331.68
Lignite	10.63	11.98	12.50
Petroleum, crude [2]	75.00	76.26	101.28
Gas, natural	[3] 4.38	[3] 4.06	4.85
Subtotal	437.85	442.87	450.31
Total	[r] 592.18	[r] 608.50	622.09

[r] Revised.

[1] Does not include crude nonsalable china clay.

[2] Estimated, applying a value of $1.45 per barrel produced in 1969 and 1970 and $1.85 per barrel in 1971.

[3] Estimated, applying a value of $0.17 per thousand cubic feet produced.

All of the individual commodities in the ferrous subgroup increased in value. However, iron ore had the most influence because it again comprised about 80 percent of the ferrous metal value in the above tabulation. Gains in the value of copper and gold produced in 1971 were the main cause of the rise in value of the nonferrous subgroup in 1971. Gold again accounted for 43 percent of the value of the nonferrous metals, as it did in 1970 (based on a revised figure), while copper accounted for 30 percent of the value of the nonferrous metals in 1971, an increase from the 28 percent (revised) of 1970. An examination of the values of the individual nonmetallic mineral commodities in 1971 and 1970 shows no clear trend. Since the value of crude nonsalable china clay was not available this year, it was permanently removed from all calculations. Limestone accounted for 33 percent of the value of the nonmetallic mineral group in 1971, as compared with 37 percent in 1970. All kinds of mica comprised 29 percent of the value of the nonmetallic group in 1971, as compared with 27 percent in 1970. Salt accounted for 16 percent of the value of the nonmetallic group in both years. Bituminous coal declined both in quantity and value, while lignite increased in both quantity and value. The rise in value of crude petroleum reflected increases in both quantity produced and value per barrel. The increase in value of natural gas from 1970 to 1971 as reported in the tabulation parallels an increase in quantity produced, but it should be noted that the value had to be estimated in 1970, while this was unnecessary in 1971.

Table 1.—India: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity[1]	1969	1970	1971[p]
METALS			
Aluminum:			
Bauxite, gross weight, thousand tons	1,085	1,370	1,437
Alumina, gross weight, do	267	327	362
Metal, primary only	131,160	161,081	178,256
Antimony, metal (regulus)	637	526	607
Beryllium, beryl, gross weight[e]	1,300	1,300	NA
Cadmium, metal	44	34	29
Chromium, chromite, gross weight	226,568	273,679	261,054
Copper:			
Mine output, metal content	10,317	10,262	10,766
Metal refined, primary only	9,751	9,311	9,678
Gold, smelter, troy ounces	109,473	104,198	118,569
Iron and steel:			
Iron ore and concentrate, thousand tons	29,564	31,366	32,288
Pig iron, excluding blast furnace ferroalloys, do	7,361	7,034	6,563
Ferroalloys:			
Ferrochrome	5,189	13,343	12,479
Ferromanganese	167,620	173,412	172,581
Ferrosilicon	27,228	27,590	28,160
Other	131	185	389
Steel ingots, thousand tons	6,461	6,098	5,950
Steel castings, do	NA	NA	28
Steel semimanufactures:			
Angles, shapes, sections, do	889	970	774
Bars and rods, do	1,737	1,572	1,448
Plates and sheets:			
Uncoated, do	601	593	588
Galvanized, do	204	171	176
Tinplate, do	88	116	117
Hoop, strip, skelp, do	569	483	464
Rails and accessories, do	494	498	466
Wire, do	183	130	216
Special steels, form not specified, do	301	286	293
Lead:			
Mine output, metal content	2,031	1,862	1,548
Metal, primary only	1,958	1,862	1,549
Manganese, ore and concentrate, thousand tons	1,485	1,651	1,779
Rare-earth metals, monazite concentrates gross weight[e]	2,600	2,600	3,882
Silver, smelter output, thousand troy ounces	105	50	133
Titanium:			
Ilmenite concentrate, gross weight	51,445	79,000	66,000
Rutile concentrate, gross weight	2,496	2,500	[e] 2,912
Tungsten, mine output, metal content	21	18	16
Zinc:			
Mine output, metal content	7,407	8,246	8,006
Metal	23,051	23,410	21,267
NONMETALS			
Abrasives, natural, n.e.s.:			
Corundum, natural	537	407	313
Garnet	1,637	986	1,046
Asbestos	9,738	10,056	10,997
Barite	51,795	74,843	61,614
Cement, hydraulic, thousand tons	13,260	13,543	14,894
Chalk	51,384	47,609	46,762
Clays:			
Ball clay	4,931	8,472	7,322
Diaspore	3,453	6,172	4,487
Fire clay	509,526	632,448	617,161
Kaolin (china clay)[2]	555,838	546,654	586,419
Diamond:			
Gem, thousand carats	[e] 10	[e] 17	[e] 16
Industrial, do	[e] 2	[e] 3	[e] 3
Total, do	12	20	19
Diatomite	--	--	77
Feldspar	32,221	29,625	34,867
Fertilizer materials:			
Crude, phosphatic:			
Apatite	9,316	15,997	11,596
Phosphate rock	69,175	149,544	248,586
Manufactured:			
Nitrogenous, nitrogen content[3]	[e] 520,000	NA	NA
Phosphatic, P_2O_5 content[4]	[e] 190,000	NA	NA
Fluorspar, all grades	1,880	4,647	2,906
Gem stones, excluding diamond:			
Agate (including chalcedony pebbles)	503	743	689
Emerald, crude, thousand carats	99	12	22
Garnet, kilograms	3,619	5,268	454
Gypsum, thousand tons	1,390	921	1,070

See footnotes at end of table.

Table 1.—India: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity [1]	1969	1970	1971 [p]
NONMETALS—Continued			
Kyanite and related materials:			
Kyanite	66,285	118,998	84,041
Sillimanite	3,946	4,562	4,284
Lime	304,938	461,672	517,189
Magnesite	295,508	354,291	299,190
Mica:			
Crude (reported output total, actual production exceeds this quantity)	17,626	15,300	14,400
Processed: [5]			
Blocks	1,789	1,630	1,301
Splittings	6,686	6,313	7,465
Condenser film	107	122	92
Other	18,474	24,876	23,017
Pigments, natural mineral, ocher	39,089	37,682	46,032
Quartz and silica thousand tons	392	266	285
Salt, all types do	6,380	5,588	5,790
Stone, sand and gravel:			
Calcite	17,249	16,839	17,149
Dolomite thousand tons	1,275	1,148	1,265
Limestone do	22,512	23,801	24,539
Slate	728	632	736
Sand, calcareous thousand tons	891	996	1,022
Sand, other do	NA	738	1,151
Talc, and related materials:			
Pyrophyllite	10,912	13,725	10,253
Steatite (soapstone)	176,580	154,686	167,081
Vermiculite	3,981	727	248
Wollastonite	448	563	2,315
MINERAL FUELS AND RELATED MATERIALS			
Carbon, black	[e] 25,000	36,287	[e] 38,000
Coal:			
Bituminous thousand tons	75,411	73,694	69,100
Lignite do	4,188	3,545	3,698
Coke:			
Coke oven and beehive do	8,939	[e] 8,710	[e] 8,340
Gashouse do	64	[e] 74	[e] 74
Other, soft do	4,126	4,000	[e] 3,555
Total do	13,129	12,784	11,969
Gas, natural:			
Gross production [e] million cubic feet	[e] 55,000	50,288	52,972
Marketable production do	25,744	23,873	25,921
Petroleum:			
Crude oil thousand 42-gallon barrels	51,726	52,596	54,748
Refinery products:			
Gasoline:			
Aviation do	205	106	([6])
Other do	13,855	13,880	13,728
Jet fuel do	3,316	5,767	23,330
Kerosine do	20,505	24,268	
Distillate fuel oil do	35,678	36,074	37,947
Residual fuel oil do	21,087	20,841	27,047
Lubricants do	584	3,083	4,245
Other do	29,343	27,598	35,723
Refinery fuel and losses do	6,794	6,882	
Total do	131,367	138,499	142,020

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to commodities listed, India also produces bromine, other clays (bentonite and fuller's earth), other varieties of gem stones (aquamarine, ruby, and spinel) uranium, and natural graphite, but production data are not available.

[2] Data given are total crude production; includes directly salable crude as follows, in tons: 1969—181,420; 1970—204,117; 1971—209,727. Balance of output in each year is classified as "nonsalable crude"; material which requires benefication prior to sale. Processing of nonsalable crude resulted in the production of the following quantities of processed china clay in tons: 1969—102,336; 1970—99,296; 1971—92,002.

[3] Includes nitrogen content of nitrogen-phosphate fertilizers.

[4] Includes phosphorus content of nitrogen-phosphate fertilizers.

[5] Actual production data not available; figures given are exports but are believed to closely approximate actual output in most years.

[6] Included with other gasoline.

TRADE

India earned $2.13 billion from all of its exports in 1971, about 18 percent of which came from the exportation of ores, minerals, and metals. India exported $377 million worth of ores, minerals and metals in 1971, compared with $416 million in 1970. India spent about 27 percent of its total expenditure of $2.50 billion for imports in 1971 on ores, minerals, metals, and crude petroleum. Indian imports of ores, minerals, metals, and crude petroleum were valued at $667 million in 1971, up from $541 million (revised) in 1970.

Iron ore accounted for 38.8 percent of the total value of ores, minerals, and metals exported in 1971, making it the most

Table 2.—India: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1970	1971
METALS		
Aluminum:		
Bauxite	54,651	61,288
Metal, including alloys, all forms	[1] 10,775	6,272
Chromite	157,540	95,765
Copper, metal including alloys, all forms	[1] 4,456	5,439
Iron and steel:		
Iron ore and concentrate thousand tons	20,425	20,382
Pig iron and sponge iron do	484	414
Ferroalloys:		
Ferromanganese	95,347	47,260
Ferrosilicon	3,529	--
Ferrochrome	8,602	4,196
Other	[r] 635	61
Iron and steel scrap thousand tons	332	198
Steel ingots and semimanufactures do	707	423
Lead, including alloys, all forms	[1] 32	31
Manganese ore and concentrate thousand tons	1,589	1,285
Nickel	--	5
Tin, including alloys, all forms long tons	[1] 1,173	160
Titanium, ore and concentrate (ilmenite)	64,858	54,049
Vanadium, ore and concentrate	20	400
Zinc, including alloys, all forms	[1] 68	32
NONMETALS		
Abrasives, natural, tripoli earth and emery	38	93
Asbestos	52	51
Barite	21,089	34,014
Bentonite	[r] 1,461	2,725
Cement	126,253	196,641
Chalk	[r] 28	10
Clays:		
Fire clay	10	4
Fuller's earth	102	4
Kaolin	207	121
Other	259	641
Feldspar	9,600	10,683
Graphite	--	77
Kyanite and related materials:		
Kyanite	68,024	45,553
Sillimanite	1,937	1,752
Lime	[r] 298	151
Magnesite	32,372	25,232
Mica, all grades	[r] 26,941	23,875
Mineral pigments	1,047	1,437
Salt thousand tons	196	111
Stone, sand and gravel:		
Building stone, not further identified	10,179	18,298
Gravel	1,983	128
Marble	108	85
Sand, including natural quartz	6,602	4,342
Talc and related materials, steatite	18,998	9,488
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen	3,235	589
Coal and coke thousand tons	529	285
Petroleum refinery products:		
Gasoline and naphtha thousand 42-gallon barrels	3,138	589
Distillate fuel oil do	348	50
Asphalt do	62	14
Total do	3,548	653

[r] Revised.

[1] Excludes scrap, if any, which is given subsequently as part of an aggregate of nonferrous metal scrap.

Table 3.—India: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1970	1971
METALS		
Aluminum, metal, all forms	r 3,938	32,354
Antimony:		
Ore and concentrate	637	868
Metal, all forms	2	207
Arsenic, sulfides	4	9
Copper, metal and alloys, all forms	50,005	56,253
Iron and steel:		
Pig iron, sponge iron and powder	201	--
Ferroalloys:		
Ferrochromium	1,133	16
Ferromolybdenum	r 194	263
Ferrophosphorus	r 233	121
Ferrosilicon	77	2,600
Ferrotungsten	r 199	75
Other	r 261	145
Total	r 2,097	3,220
Steel ingots and semimanufactures	r 606,881	1,020,348
Lead:		
Ore and concentrate	101	49
Metal, including alloys, all forms	39,571	41,387
Manganese ore	3,727	3,346
Nickel:		
Metal and alloys, all forms	2,492	3,558
Platinum, metal ... troy ounces	4,340	11,574
Silver, metal ... do	37,551	31,636
Tin, metal and alloys, all forms ... long tons	2,406	2,856
Tungsten ore concentrate	r 263	325
Zinc:		
Ore and concentrate	47,001	34,394
Metal, including alloys, all forms	73,947	96,813
NONMETALS		
Abrasives, natural, tripoli earth	r 2,177	1,491
Asbestos	39,693	45,174
Boron materials (borax)	r 18,654	9,169
Clays:		
Ball clay	451	1,845
Bentonite	5	7
Fire clay	4	--
Fuller's earth	r 28	17
Kaolin	1,295	955
Other	105	769
Diamond:		
Gem ... value, thousands	$26,579	$28,044
Industrial ... thousand metric carats	205	350
Diatomaceous earth (kieselguhr)	r 125	5
Fertilizer materials, crude:		
Nitrogenous, sodium nitrate	r 2,025	3,015
Phosphate rock ... thousand tons	925	697
Fluorspar and cryolite:		
Cryolite	2,801	765
Fluorspar	11,733	14,055
Graphite	1,504	921
Gypsum and plaster	5	5
Magnesite	59	52
Mineral pigments:		
Red oxide	2,124	1,413
Other (earth colors)	680	4
Stone, sand and gravel:		
Alabaster	17	84
Building stone, not further specified	2	--
Gravel	44	--
Limestone	r 6	4
Marble	10	8
Sand, all types	r 9	7
Sulfur	558,513	441,270
MINERAL FUELS AND RELATED MATERIALS		
Asphalt, natural	1,137	499
Coal, anthracite	782	733
Coke	3,091	4,876
Petroleum:		
Crude oil ... thousand 42-gallon barrels	86,557	92,667
Refinery products:		
Aviation gasoline ... do	432	450
Kerosine and jet fuel ... do	2,846	4,863
Residual fuel oil ... do	2,494	6,036
Lubricants ... do	2,290	1,130
Total ... do	8,062	12,479

r Revised.

important export. Next in importance was iron and steel, which accounted for 18.3 percent of the total; then diamond, 11.2 percent; mica, 5.8 percent; and pig and cast iron, 5.6 percent. Iron and steel was by far the most important import, accounting for 36.1 percent of the total value of ores, minerals, metals, and crude petroleum imported. Other important imports were crude petroleum, with 25.7 percent of the total value, copper metal and alloys with 10.4 percent, zinc with 4.6 percent, and gem diamond with 4.2 percent.

Definite data on India's principal trading partners in the total flow of mineral commodities were not available. Japan was the most important destination for exports, probably accounting for over 35 percent of the total. Other important destinations included the U.S.S.R., Belgium, the United States, the Arab Republic of Egypt, and Hong Kong, not necessarily in that order. The import situation is less clear; the major sources of India's imports were Iran (crude petroleum), the United Kingdom, Japan, the United States, Zambia, and Belgium, not necessarily in that order.

COMMODITY REVIEW

METALS

Aluminum and Bauxite.—Indian bauxite production increased again in 1971 as did production of aluminum metal. Exports and imports were minor, with the exception of aluminum metal imports. India imported 32,354 tons of aluminum metal, mostly ingot, worth $18.1 million in 1971, 42 percent of the total coming from Canada, 39 percent from the United States, and the balance from other nations.

India produced 1,437,000 tons of bauxite in 1971, with Bihar providing 38 percent of this total, Maharashtra providing 19 percent, Madhya Pradesh and Gujarat each providing 15 percent, and the other States and territories supplying the balance. Bauxite exports rose in 1971 to 61,288 tons worth $1.08 million, of which 24,327 tons went to Japan, 21,176 tons to Czechoslovakia, 12,985 tons to Italy, and the balance to other destinations. India consumed 1.38 million tons of bauxite in 1971, 1.07 million tons of which were used in the manufacture of alumina and aluminum metal.

The following tabulation shows the production and capacity of the Indian aluminum industry:

Company, plant, and location of plant	Thousand metric tons			
	1971		1973 Proposed capacity	1975 Proposed capacity
	Output	Capacity		
Aluminium Corp. of India Ltd: Asansol, West Bengal	8	9	12	12
Bharat Aluminium Co. Ltd.:				
Koyna, Maharashtra	--	--	--	50
Korba, Madhya Pradesh	--	--	100	100
Hindustan Aluminium Corp. Ltd.: Renukoot, Uttar Pradesh	78	80	100	120
Indian Aluminium Co. Ltd.:				
Alwaye, Kerala	17	16	16	16
Belgaum, Mysore	38	40	40	60
Hirakud, Orissa	25	20	20	20
Madras Aluminium Co. Ltd.: Mettur, Tamil Nadu	13	13	25	25
Total	179	178	313	403

Apparent consumption of aluminum jumped to 204,300 tons in 1971, compared with an estimated demand for 233,000 tons in 1971. The Planning Commission estimates that demand will reach 273,000 tons in 1973 and 313,000 tons in 1975.

Antimony.—India produces no antimony ore, and therefore relies entirely on imports of ores and concentrates together with a small quantity of metal. India imported 868 tons of antimony concentrates worth $1,527,117 in 1971, 505 tons of which came from Bolivia, 248 tons from Peru, and the balance from other sources. India's sole importer and processor of antimony ore and concentrates is the privately owned Star Refinery (P) Ltd. of Bombay. This refinery produced at only 60 percent of its 1,000-ton capacity in 1971. The Planning Commission estimates that demand for antimony in 1971 was 1,100 tons of metal.

Beryl.—Indian production of beryl seems to have declined to an insignificant level; more detailed information is not available because the Government classifies beryl as a strategic mineral and hence releases little information about it. There do not seem to have been any exportable beryl surpluses for several years. Although reserves are large, the Government has apparently either deemphasized or made poor progress in implementing its previously announced beryl exploitation incentive scheme. The decline in production and exports may also be related to maintenance of the Government-controlled beryl price at an uneconomic level.

Chromite.—Chromite production in 1971 was 261,054 tons worth $2.5 million, as compared to 273,679 tons worth $2.1 million in 1970. Japan took all of the 1971 exports of 95,765 tons of chromite valued at $2.8 million. Of the total chromite exported, 53,800 tons graded 48 to 56 percent Cr_2O_3, 14,200 tons graded 38 to 48 percent Cr_2O_3, and 27,765 tons graded below 38 percent Cr_2O_3. India also exported 4,196 tons of ferrochrome worth $1,660,916; 52 percent of this quantity went to the United States, 16 percent each to West Germany and Austria, and the remaining 16 percent to other nations. The Government's Planning Commission estimates that India's demand for chromite will be 300,000 tons in 1973, 110,000 tons of this total for metallurgical uses, 50,000 tons for use in refractories, 40,000 tons for chemical and other uses, and the remaining 100,000 tons for export.

Copper.—The Planning Commission estimates that the demand for copper in 1971 was 103,700 tons. The Indian Copper Corp., the only domestic producer, met a small part of this demand. Their new and larger flash smelter was placed on trial production on December 31, 1971. India met most of its demand by importing 54,389 tons of copper metal valued at $65.7 million. Of this, 20,283 tons came from Zambia, 19,651 tons from the United States, and the balance from other sources. Indian Government agencies now estimate that India's copper reserves total 306 million tons of ore averaging about 1.4 percent copper. Of this total, 91 million tons of ore are proved, 139 million tons are indicated, and 76 million are inferred. The State of Bihar has 45 percent of the total reserves, Rajasthan has 38 percent, and other States have the balance.

Gold.—Indian gold production rose in 1971 because both of the public sector producers were able to increase production. Kolar Gold Mining Undertaking reported an increase from 360,528 tons of ore containing 0.17 troy ounce of gold per ton in 1970 to 390,655 tons containing 0.19 troy ounce of gold per ton in 1971. Production of Hutti Gold Mines Co. increased from 160,918 tons of ore containing 0.26 troy ounce of gold per ton in 1970 to 178,050 tons containing 0.25 troy ounce of gold per ton in 1971.

The Kolar Gold Mining Undertaking stated that its operating costs were $8.0 million and its gross receipts from the sale of gold to the Government were $2.3 million during fiscal year 1970–71. Similar data for Hutti Gold Mines Co. are not available, but it is most probable that it operated at a loss too.

Indian gold production is only a fraction of demand, which is probably about 300 tons per year in India. Recycled domestic gold scrap meets about one-third of the demand, with the balance being filled by gold smuggled into the country from Persian Gulf States such as Dubai.

Ilmenite, Rutile, and Monazite.—The Government-owned Indian Rare Earths, Ltd., expanded the capacity of both of its mineral sand benefication plants in 1971. Its plant at Manavalakurichi now has a annual capacity of 60,000 tons of ilmenite, 5,335 tons of zircon, 4,443 tons of monazite, 2,225 tons of garnet, and 1,186 tons of rutile. Its new plant at Chavara, now reported to be onstream, has an annual capacity of 100,000 tons of ilmenite, 7,000 tons of zircon, 585 tons of monazite, 5,850 tons of rutile, and 4,100 tons of sillimanite.

Indian Rare Earths, Ltd. also has a processing plant at Alwaye, Kerala, which treated about 3,800 tons of monazite during 1971 to produce various rare–earth chemicals.

Iron Ore.—India's iron ore production increased in 1971 over 1970, with none of the growth spilling over into exports. The Union Territory of Goa supplied 29.8 percent of the total 1971 iron ore production, Madhya Pradesh supplied 22.4 percent, Orissa supplied 19.6 percent, Bihar supplied 15.0 percent, Mysore supplied 10.8 percent, and other States supplied the remaining 2.4 percent. Domestic consumption of iron ore was 10.7 million tons in 1971. Normal consumer stocks and stocks assembled in anticipation of the opening of the Bokaro steel plant totaled 1.2 million tons. India exported 20.38 million tons of iron ore worth $146 million in 1971, giving an average value per ton of $7.18 in 1971. Table 4 shows iron ore exports by destination. The private sector operators of Goa exported 51 percent of the total, while the Government's Minerals and Metals Trading Corp. (MMTC) exported the balance. Of the 20.38 million tons of iron ore exported, 10.35 million tons left from the port of Marmagao, 4.60 million tons from Visakhapatnam, 1.90 million tons from Madras, 1.81 million tons from Paradip, and the balance from other ports.

Operating iron ore mines totaled 299 in 1971, all open pit, of which 11 were captive mines. Thirty mines produced over 100,000 tons in 1971.

There were no significant new iron ore developments in 1971.

Iron and Steel.—Indian production of pig iron and steel declined again in 1971; production of several of the more important ferroalloys also declined. The main exceptions were ferrosilicon, which rose from 27,590 tons in 1970 to 28,160 tons in 1971, and also ferromolybdenum, which rose from 129 tons in 1970 to 255 tons in 1971.

A significant increase in imports combined with a decrease in exports made India even more of a net importer of ferrous metals (iron, steel, scrap, and ferroalloys) in terms of value in 1971 than it was in 1970. Imports of ferrous metals exceeded exports by $141.3 million in 1971, while imports of ferrous metals exceeded exports by only $31.6 million (revised) in 1970. The Government encouraged increased imports by issuing additional import licenses and removing some restrictions on imports, while putting restrictions on exports at the same time.

Table 4.—India: Exports of iron ore

(Million metric tons)

Destination	1970	1971
Belgium	0.35	0.27
Czechoslovakia	.72	.68
Germany:		
East	.04	--
West	.11	--
Hungary	.12	.10
Japan	16.47	16.79
Poland	.38	.38
Romania	1.54	1.38
Yugoslavia	.20	.20
Other	.50	.58
Total	20.43	20.38

In spite of the fact that the large increase in net imports of steel more than offset the small decline in its production, steel was again in short supply in 1971. However, the shortage was not as serious as in 1970, although production was less than apparent consumption and both were less than the domestic demand for finished steel. Production of finished steel supplied about 84 percent of apparent consumption, and only 79 percent of the projected domestic demand in 1971. Given this need for more steel, the domestic industry was only able to produce steel ingot at a rate slightly more than 65 percent of 1970–71 plant capacity. The small decline in rate of utilization of plant capacity from 1970 to 1971 can be broken down to show little change at most plants, a small decline at the plant of Indian Iron and Steel Co. (IISCO), and a large decline at Rourkela which reflected several months of curtailed production caused by the collapse of the melting shop roof in July 1971.

The Government has taken several other steps to further relieve the steel shortage besides greatly expanding net imports of steel. The Government has followed through on last year's decision to give high priority to the licensing of additional electric furnace continuous casting plants with capacities of about 50,000 tons. It has issued 19 licenses so far for plants with a total capacity of 950,800 tons of mild steel ingot. One such plant went on-stream in October 1971, although its licensing predates the recent rise in priority. Another plant also began production recently, although it is using conventional methods until its continuous-casting equipment can be installed. Also helping to mitigate the steel shortage will be the long-delayed startup of the first blast furnace of the new Bokaro plant, possibly in 1972. The first stage of the Bokaro steel plant has a capacity of 1.7 million tons of raw steel. The Government now seems to be more interested in expanding the capacity of the existing larger plants rather than in building new plants. None of the existing plants are yet operating above their 1970–1971 capacities, although the commissioning of a 600,000-ton-per-year blast furnace at the Bhilai plant in late July gives some grounds for hope that this may not be true too much longer. The Government has also set up a holding company for steel and such associated industries as coking coal, iron ore, and refractories. The holding company will own all the shares of the public sector corporations, plus the Government shares in private sector firms. The Government holds 40 percent of the equity of the Tata Iron and Steel Co. (TISCO) and 49 percent of IISCO. The holding company will oversee, plan, and coordinate operations, although the present management structure will presumably remain intact. It remains to be seen whether the holding company will improve the situation or simply add another layer of bureaucracy. The Government does seem to have had some success in streamlining its steel distribution policy; it claims that over 90 percent of production now goes directly from producer to final consumer. Thus it seems that the Government has been able to make some progress in relieving the steel shortage, although some of the measures taken will require at least several years to have an effect.

Lead and Zinc.—Only one lead-zinc mine operated in India in 1971, the Zawar mine in Rajasthan, and India imported most of its lead-zinc supply.

The Zawar mine produced 293,536 tons of ore containing 0.53 percent Pb and 3.5 percent Zn in 1971. Production of lead concentrates was 4,043 tons in 1971, compared with 3,880 tons in 1970. Production of zinc concentrates totaled 15,397 tons in 1971, compared with 15,888 tons in 1970.

India imported 34,394 tons of zinc concentrates having a value of $3.6 million in 1971, of which 11,835 tons came from Canada, 10,867 tons from Australia, 10,608 tons from Bolivia, and 1,084 tons from Peru. Imports of zinc metal and alloys, mostly zinc or spelter, totaled 96,813 tons in 1971, 21,436 tons of which arrived from Australia, 20,614 tons from Canada, 15,318 tons from Japan, 13,368 tons from the U.S.S.R., and the balance from other sources.

Zinc supply (including imports) more than met demand in 1971, for the first time in recent years. Zinc supply totaled 118,050 tons while demand was 117,500 tons.

As in previous years, India did not have enough lead to meet its needs. India's only lead smelter, located at Tundoo, produced 1,549 tons of lead while using only 29 percent of capacity. India imported 41,387 tons of lead metal worth $12.0 million in 1971, of which 16,921 tons originated in Australia, 13,822 tons in Canada, 8,253 tons in Burma, and the balance in other countries. The available lead supply was insufficient to meet an estimated lead demand of 80,500 tons.

The two Indian zinc smelters produced zinc at about 56 percent of capacity. The Hindustan Zinc Ltd. smelter at Debari, which has a capacity of 18,000 tons per year, produced 11,000 tons of zinc in 1971. The Cominco Binani Zinc Ltd. smelter at Alwaye, which has a capacity of 20,000 tons per year, only produced 10,267 tons of zinc in 1971.

Attempts to expand mine production did not go well, but some progress was made on smelter expansion. The plan to expand production at the Zawar mine now envisions a production level of 2,000 tons per day rather than the original 3,000 tons per day. (Present production level is 800 tons per day). At the same time, the completion date was moved to the end of 1972. The planned expansion to double capacity at the Debari zinc smelter seems to be on schedule. Plans to double the capacity of the Alwaye zinc smelter have received Government approval. The Government also approved the plans mentioned in last year's chapter for a public sector zinc smelter at Visakhapatnam.

Manganese.—Production of manganese ore in 1971 was larger than in 1970, although the quantity exported was less. The State of Orissa supplied 26 percent of India's 1971 production of manganese ore, Mysore also supplied 26 percent, and several other States supplied the remainder. Work by the Geological Survey of India and the Indian Bureau of Mines has led to the estimation of new figures for manganese ore reserves; the all-India total for reserves of measured and inferred ore is now 106.0 million metric tons.[4] During 1971 a total of 313 mines operated; of these, 293 were in the private sector and the balance were Government-owned. Exports of manganese ore by type and destination are shown in table 5. The domestic consumption of 784,000 metric tons in 1971 was larger than that of 1970, which was only 748,600 tons. Of the total 784,000 tons in 1971, 400,000 tons went into making ferromanganese, 375,000 tons was consumed in iron and steel production, with the remainder being mostly used by battery producers.

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[4] Balasundaram, M. S. A Review of the Reserves and Demand Pattern of Iron, Manganese and Chromite Ores in India. The Eastern Metals Review (Calcutta), v. 25, Annual Number, April 1972, pp. 39–49.

Table 5.—India: Exports of Manganese ore, by destination

(Thousand metric tons)

Destination	1970	1971
Belgium	32	43
Canada	--	40
Czechoslovakia	51	34
France	11	15
Italy	17	(1)
Japan	1,230	1,081
Korea, South	--	19
Netherlands	96	--
Spain	72	29
United Kingdom	5	4
United States	68	17
Other	10	4
Total[2]	1,590	1,285

[1] Less than ½ unit.

[2] Data may not add to totals shown because of independent rounding.

Uranium.—The Government of India has been doing intensive exploration in the Narwapahar and Bhatin areas of Bihar State, and has also been exploring in parts of the States of Madhya Pradesh, Uttar Pradesh, and Himachal Pradesh. The Atomic Energy Department claims that "reasonably assured resources" are now over 33,000 tons of uranium oxide. This is a fortuitous discovery, because previously known reserves were estimated to be capable of generating less than one-quarter of the nuclear power needed by the year 2000.

NONMETALS

Cement.—Supply and demand were again in overall balance in 1971, although there were frequent delivery delays and local shortages. Production in 1971 rose to 14.9 million tons, which paralleled the rise in consumption to 14.6 million tons. Exports rose to 196,641 tons valued at $3.0 million, 88,900 tons of which went to Muscat, 59,383 tons to Nepal, 31,600 tons to Ceylon, and the balance to other destinations. Yearend stocks totaled 300,000 tons in 1971. Installed cement production capacity increased to 18.3 million tons as of the end of 1971.

Fluorspar.—India's production of mine-run fluorspar in 1971 was a disappointing 2,906 tons worth $300,000. This resulted from the sole producer in Gujarat having materials-handling problems and a lack of funds needed to purchase modern mining equipment. Also contributing was the almost total lack of progress in the construction of another fluorspar beneficiation plant in Rajasthan. India met the deficiency by importing 14,055 tons of fluorspar worth $1,378,845, with 9,355 tons of this coming from Italy. The Planning Commission estimates that consumption was 13,400 tons in 1971, of which 10,000 tons went into chemical uses, 2,100 tons was used in iron and steel production, and the balance went into other uses. They estimate that consumption will be 49,300 tons in 1978.

Gypsum.—Indian production of gypsum in 1971 balanced consumption and rose to 1,070,021 tons worth $1.5 million, with 89 percent of this quantity coming from Rajasthan. About 80 percent of the production was fertilizer-grade gypsum averaging 80 to 85 percent $CaSO_4 \cdot 2H_2O$. India consumed 1.1 million tons of gypsum in 1971; fertilizer manufacture (at Sindri) took 600,000 tons of this, cement manufacture took 457,000 tons and the balance of 13,000 tons found other uses. The Government's Planning Commission foresees a gypsum consumption of 1.9 million tons in 1983, with 1.3 million tons of this going to the cement industry and with almost all the balance going to the fertilizer industry. It appears that the Sindri plant will continue to use gypsum for a number of years before switching to a pyrite feed.

Kyanite and Sillimanite.—While India is a major producer of kyanite on a world basis, the first attempt to evaluate reserves more precisely was made in 1971. Preliminary results suggest that indicated and inferred reserves of kyanite total 3.79 million tons. Indian production of kyanite in 1971 dropped to 84,041 tons valued at $2.7 million, with about 69 percent of the output coming from Bihar, 30 percent from Maharashtra, and the balance from Mysore and Orissa. Stocks at the beginning of 1971 were 16,715 tons (revised), domestic consumption was about 36,000 tons, and yearend stocks were 19,200 tons. India exported 45,553 tons of kyanite worth $2.7 million in 1971, of which 11,430 tons went to the United Kingdom, 7,105 tons to West Germany, 6,565 tons to Italy, 4,748 tons to Japan, and the balance to other nations, mostly European.

Indian production of sillimanite in 1971 also dropped, in this instance to 4,284 tons, with Meghalaya (formerly part of Assam) accounting for 82 percent of the total output; Kerala accounted for almost 10 percent, and the balance came from other States. The Indian refractories industry consumed about 2,300 tons of sillimanite in 1971, asbestos products manufacturers used about 200 tons, and glass manufacturers used 32 tons. India exported 1,752 tons of sillimanite worth $141,148, of which, 955 tons went to West Germany, 541 tons to Japan, and the balance to other nations.

Limestone.—India produced 24.5 million tons of limestone worth $28.2 million in 1971. In addition, village workmen mine significant but unknown quantities of limestone each year for village-oriented requirements. Domestic consumption equalled the production of 24.5 million tons; of this total, 19.0 million tons of limestone were used by the cement industry, 3.2 million tons by the iron and steel industry, and the balance by other industries. The Planning Commission estimates that demand will be 31.6 million tons in 1973 (24.0 million tons for cement alone) and 50.1 million tons in 1978 (36.7 million tons for cement).

Although India's total reserves of limestone are unknown, the Government has set aside reserves of 18.6 billion tons for use by the cement and iron and steel industries. Of this quantity, 13.1 billion tons are located in Andhra Pradesh, and the balance is scattered among several other States.

Magnesite.—The decline in magnesite production in 1971 to 299,190 tons worth $1.1 million was reportedly caused by labor difficulties in the mines of Tamil Nadu. Tamil Nadu accounted for 97 percent of the total production. India consumed 274,250 tons of magnesite in 1971, 270,000 tons of this as refractories (lightly calcined and dead-burned). India does not produce any magnesium metal, although a Council of Scientific Research committee has recommended that it do so. India imported 389 tons of magnesium metal in 1971.

Newly revised figures show Indian magnesite reserves to be 79.8 million tons. The Salem District of Tamil Nadu accounts for 43.4 million tons of this total, and the Almora District of Uttar Pradesh accounts for most of the remainder. The Tamil Nadu reserves have a grade of 43.0 percent magnesium oxide.

Mica.—Indian production of all kinds of mica, as measured by exports, declined in quantity while it rose in value in 1971, and India maintained its status as a major world producer of mica. Domestic consumption of mica totaled 8,000 tons, of which 6,760 tons were used in refractories, 500 tons in electrodes, 375 tons in rubber, and the balance in other uses. However, India exported most of its mica production; table 6 shows the amount of mica exported, by type. The mica exported in 1971 had a total value of $21.7 million, compared with $22.1 million in 1970. Of the total value of $21.7 million for all types of mica exported in 1971, $9.7 million was in the form of blocks, $6.7 million as splittings, $1.5 million as films, $1.5 million as washer and disks, and the balance as other types. Of this total $6.6 million went to the U.S.S.R., $3.4 million to the United States, $2.1 million to Japan, $1.5 million to Poland, $1.4 million to the United Kingdom, and the balance to other destinations.

Mica production was reported by 451 mines in 1971, and 100 mines claimed production of more than 50 tons.

The Government announced that mica exports in the future would be made only through the Government-owned MMTC, starting in January 1972. In an effort to minimize the concern of the foreign buyers, the MMTC later announced that they would consider requests from private mica exporters to negotiate sales directly, but only on behalf of MMTC.

Nitrogen.—India produced 830,000 tons N content of nitrogenous fertilizer materials in the Indian fiscal year which ended March 31, 1971. Since India consumed about 1.2 million tons N content of nitrogen fertilizer in the same period, the balance of 428,000 tons N content was met from imports. Estimating on the basis of plant capacity and in terms of nitrogen content, about 54 percent of the nitrogen fertilizer produced was urea, about 17 percent was ammonium sulfate, and the balance was other solid fertilizer materials.

The raw material for about 70 percent of Indian production of nitrogen fertilizers

Table 6.—India: Mica exports, by type

(Metric tons)

Type	1970	1971
Block	1,630	1,301
Film	123	92
Cut condenser film and plate	138	21
Cut sheet and strip	21	34
Washer and disc	119	136
Splittings	6,313	6,025
Scrap and waste	14,972	13,105
Powder	3,616	3,140
Micanite and builtup mica	10	21
Total	26,942	23,875

is locally produced naphtha, with the remaining 30 percent being such domestic inputs as coke oven gas, natural gas, electric power, and lignite. However, Indian naphtha-producing refineries took about 66 percent of their feed from foreign sources. Therefore, only about 54 percent of the raw material for nitrogen fertilizers is ultimately of domestic origin. The naphtha supply-demand projections of the Indian Institute of Petroleum indicate that the domestic portion of the raw material input for nitrogen fertilizers will be further diluted as the present surplus of locally produced naphtha becomes a shortage in the next few years, a shortage that might lead to direct imports of naphtha. However, the Government is planning some new nitrogen fertilizer plants that would use raw materials other than naphtha.

Most of this Government-planned nitrogen fertilizer capacity would be in plants using coal as a raw material. The Government-owned Fertilizer Corp. of India is planning and building three urea fertilizer plants, each with a capacity of 228,000 tons N content and each costing $127 million. They would use surplus low-grade coal. Two of the plants, located near collieries at Talcher in Orissa and at Ramagundam in Andhra Pradesh, have been under construction since 1970. The third plant probably will be sited at Korba in Madhya Pradesh. The Fertilizer Corp. of India has contracted to receive technical assistance from various interests in West Germany and Italy. If the construction of the two plants stays on schedule, they should commence production in 1974 or 1975. The factors most likely to throw the construction off schedule are escalating costs and associated lack of foreign exchange. The foreign exchange component now accounts for about $47 million of the total $127 million needed for each project. The World Bank has so far refused to provide any assistance for the projects on the grounds that India should use the cheapest feedstock, whether domestic or imported. Using indigenous coal would be much more expensive for India than importing liquefied anhydrous ammonia. Thus the situation is still fluid with the two plants that are in the early stages of construction likely to be completed, but with the proposed Korba plant having dubious prospects.

The coal-based urea fertilizer plants would be a very significant addition to the Indian nitrogen fertilizer industry. The capacity of the two plants being built is 456,000 tons of contained nitrogen, which compares to a total installed nitrogen fertilizer capacity of 1.3 million tons of contained nitrogen as of December 31, 1970. In addition to these two plants, there is a further capacity of 1.2 million tons under construction. The fourth 5-year plan originally provided for an installed capacity of 3.0 million tons of nitrogen by March 31, 1974, which is now expected to be 2.3 million.

Phosphate Rock.—India produced 248,586 tons of phosphate rock worth $2.74 million in 1971, 95 percent of this from the Jhamar Kotra mine of Rajasthan. India met most of its phosphate needs by importing 696,693 tons of phosphate rock worth $13.69 million in 1971, 403,012 tons of this from the United States, 119,850 tons from Jordan, 119,080 tons from Morocco, and the balance from elsewhere. India also imported a minor amount of phosphate fertilizers.

While the Jhamar Kotra mine was able to maintain its newly expanded production level of 1,000 tons per day in early 1971, the level later fell so that mining output averaged about 700 tons per day for the whole year.

MINERAL FUELS

Coal.—As usual, coal was India's most important mineral commodity in terms of value, although both quantity and total value were lower in 1971 than in 1970. However, the average value per ton in 1971 was $4.80, compared with $4.75 in 1970.

The total production of 69.1 million tons for 1971 can be broken down in several different ways. India's privately owned collieries accounted for 72.9 percent of the 1971 production, the Government's National Coal Development Corp. accounted for 20.7 percent, and Singareni Collieries Co. Ltd. (a State-Central Government venture) accounted for the remaining 6.4 percent. Coking coal comprised 16.1 million tons of the total production in 1971. Underground mines supplied 78 percent of the total output, with open pit mines supplying the balance. Bihar was India's leading coal-producing State with 44 percent of total production in 1971, followed by West Bengal with 25 percent, Madhya Pradesh with 18 percent, and other States with the balance.

The Indian coal industry has a production capacity of about 90 million tons per year for all types and grades. The industry claims that it could attain an additional 10 million tons within 2 years.

Indian consumption of coal in 1971 totaled 69.0 million tons. Of this total, the Indian railways consumed 15.3 million tons; steel plants consumed 13.5 million tons (almost all coking coal); thermal power plants, 10.8 million tons; cement plants and brick kilns, 7.0 million tons; merchant coke ovens and soft coke plants, 5.5 million tons; and other industries, such as textiles and paper, consumed the remainder. Coal met about 70 percent of India's commercial energy requirements in 1971; petroleum, 25 percent; and hydroelectric and nuclear power, the remainder.

Indian coal reserve figures were recently revised downward in order to reflect current economics of coal mining. Coal reserves now total 81 billion tons, 21 billion tons of which is proved. Prime and medium coking coal comprise about 19 percent of the total reserves. Bihar and West Bengal have about 67 percent of India's total coal reserves as well as all of India's known coking coal reserves.

Although the Government foresees a large growth in coal use, the coal industry experienced about as many difficulties in 1971 as it did in 1970. Labor problems in the steel plants and in the coal industry itself were an important cause of a further decline in production. The shortage of rail cars at peak shipping times grew even more severe than it was in 1970. Undelivered pithead stocks declined only slightly to 8.4 million tons by the end of 1971. The Planning Commission estimated that future coal consumption will be as follows:

Industry	Million Metric Tons		
	1973	1978	1983
Railways	14.3	13.0	11.7
Steel plants	19.1	35.6	52.2
Thermal power plants	31.3	63.0	90.0
Cement plants and brick kilns	9.3	14.6	21.5
Merchant coke and soft coke	9.8	13.9	20.3
Other	17.9	27.1	37.5
Total	101.7	167.2	233.2

The Government of India took over the management of 214 private sector coking coal mines and coke ovens on October 16, 1971. These mines will be fully nationalized in 1972 after the Government submits a report to Parliament stating the financial condition of the mines and the recommended compensation. The Government justified its action by citing the need for more effective management, exploitation, and conservation in the coking coal industry, which in turn would insure the future development of the nation's steel industry. The newly formed Bharat Coking Coal, Ltd. will control the Government's mines. Interestingly enough, industry's reaction to the takeover was generally favorable.

Lignite.—The only producer of lignite in 1971 was again the mine of the Government-owned Neyveli Lignite Corp., Ltd. of Tamil Nadu. While production was up, results still did not meet the target, reportedly because there were problems with the mining equipment at this fully mechanized mine. Their urea fertilizer plant produced 50,000 tons of product, which is about one-third of the plant's capacity. Their briqueting and carbonization plant produced 85,260 tons of briquets, which is only slightly better than one quarter of the plant's capacity. Both shortfalls were blamed on the inadequate supply of lignite.

Total reserves of lignite are now estimated to be 2.02 billion tons, about 85 percent of this being proved reserves at Neyveli.

Natural Gas.—Both gross and marketable natural gas production increased in 1971 over 1970. As of January 1, 1971, proved reserves of natural gas were 1,800 billion cubic feet, down 292 billion cubic feet from last year's total. Assam had 72 percent of these reserves and Gujarat had the balance.

Petroleum.—India's petroleum industry had another slow year in 1971. Production of crude petroleum increased by 2.1 million barrels to a total of 54.7 million barrels in 1971. Gujarat again supplied 52 percent of India's production of crude petroleum; Assam supplied the balance. Imports of crude petroleum rose again, reaching 92.7 million barrels in 1971 compared with 86.6 million barrels in 1970. Of the 92.7 million barrels imported, Iran supplied 72.6 million barrels and Saudi Arabia supplied the balance. The throughput of Indian refineries was 146.8 million barrels, and their output, excluding plant fuel and losses, was 139.1 million barrels. Imports of refined products were greatly increased over 1970, while exports of refined products were only a fraction of those of 1970.

Exploration, Drilling and Crude Oil Pro-

duction.—No major discoveries of petroleum occurred in 1971. Work on the deep well at Suruin (near Jammu) was disappointingly slow; by the end of 1971, drilling had reached a depth of only 8,038 feet towards its planned objective of 20,000 feet. Compagnie Geophysique de Francaise contracted to perform a detailed seismic survey of the "Bombay High" anomaly in 1972 for the Oil and Natural Gas Commission (ONGC). This survey is a preliminary to drilling, which the Government hopes to begin in 1973.

During 1971, the ONGC completed only 64 wells for a total of 357,600 feet drilled, the lowest exploration and drilling record for ONGC since 1962. Oil India, Ltd. completed 14 wells with a total 174,300 feet drilled; information for Assam Oil Co., Ltd. was unavailable. India had 1,079 producing oil wells at the end of 1971, 86 gas wells, 106 wells under test, and 38 water injection holes in operation.

The decline in exploration by the ONGC came to the attention of the Government and Parliament. The ONGC operating program schedules it to complete an average of 102 wells for a total of 820,000 feet drilled each year for the period 1969–1973. However, exploration has been steadily declining since 1968, when the ONGC actually met its target. A committee headed by K. D. Malaviya found that less than 30 of the 53 ONGC drills were in the field and operating. The remaining drills were reportedly inoperative because of inadequate maintenance, lack of spare parts, and inefficient program planning of each drill at each wellsite.

Refining.—Refinery output in millions of barrels is shown by the following tabulation:

Refineries	1970	1971
Private:		
Digboi	3.5	3.4
Burmah-Shell	24.8	28.0
ESSO	16.7	19.8
Caltex	8.3	8.8
Subtotal [1]	53.3	59.9
Government-controlled:		
Gauhati	4.9	5.3
Barauni	15.9	16.1
Koyali	25.1	26.1
Cochin	18.4	17.3
Madras	14.1	14.4
Subtotal [1]	78.3	79.2
Total [1]	131.7	139.1

[1] Data may not add to totals shown because of independent rounding.

The increase in production by the private sector can be explained by the company's response to a Government request to increase production to meet the emergency conditions existing in the last half of the year. The companies could respond because their installed capacities total 68.1 million barrels, even though their licensed capacities total 56.7 million barrels. In the public sector, the Cochin refinery reportedly had a shortage of feedstock and mechanical difficulties in 1971. Imports comprised 63 percent of all refinery feedstock in 1971.

The Government only allows refinery expansion in the public sector. The Government postponed the previously announced expansion of the Koyali refinery until more crude oil reserves are discovered in nearby onshore or offshore areas. Even though the Barauni refinery has not reached its present 22.5-million-barrel annual capacity because of shortages of Assam crude, plans to expand it to 25.0 million barrels were announced. A planned pipeline from Haldia will supposedly bring enough imported crude to operate Barauni at its full capacity. The expansion of the Cochin refinery to a capacity of 25.68 million barrels annually is reportedly on schedule for completion in late 1972. The Government is building a new 7.25-million-barrel-capacity refinery at Bongaigon in Assam, with completion scheduled for 1975.

Transportation.—There were no significant changes in India's petroleum transportation facilities in 1971.

Marketing.—In 1971, the Government-owned Indian Oil Corp. (IOC) sold about 56 percent of all petroleum products in India, as compared to 52 percent the previous year. All of the private-sector companies suffered a loss in their share, and Burmah-Shell even had a decline in actual volume sold. Explaining most of the growth in IOC's share was the Government's previously-existing prohibition of growth in (foreign) private-sector sales and outlets combined with continuing growth in the number of IOC outlets and volume of sales. However, the IOC had to buy petroleum products from the private-sector refineries to fill the gap when it found itself unable to supply India's defense forces and its sales outlets in the latter part of the year. Therefore most of the growth in IOC's share actually came from private-sector production.

The Mineral Industry of Indonesia

By Walter Pajalich[1]

Persistent efforts towards political stabilization and consolidation of social affairs in 1971 resulted in acceleration of economic activities. The economic reform program initiated by the Government in 1966 has been markedly successful in curbing the annual inflation rate from 650 to 9 percent. The strongest force behind the economy's growth was the rapid increase of fixed investments and development expenditures.

Liberalization of national laws governing foreign investments, among which was the Foreign Capital Investment Law (Law No. 1) and Mining Law (Law No. 11), paved the way for this growth. Under the new mining law, foreign companies may obtain exclusive rights to conduct mineral exploration and exploitation on the basis of a "Contract of Work" agreement with the Government. Foreign companies may also act as mining operators or contractors for State-owned mining enterprises. In the case of petroleum and natural gas, extraction may only be undertaken by a State enterprise. Consequently, all foreign participation in the oil and gas industry of Indonesia has to be based on a "production sharing" or "development" contract with the State oil enterprise Pertambangan Minjak Dan Gas Bumi Nasional (P. N. Pertamina). These contracts which call for a 65/35 profit split in favor of the Government have been generally used with all the international petroleum developers. P. N. Pertamina has reserved the inland areas for itself and contracted the offshore areas to foreign developers.

The interests of foreign oil companies in Indonesia are immense and increasing. There are over 50 foreign companies with equity interests in the oil operations of the country. At least 35 companies were exploring for oil, 18 of which were United States companies.

Significant legislation affecting the State enterprise, P. N. Pertamina, was scheduled to be implemented in January 1972. Government Regulation No. 72 and Presidential Decree No. 127-M stipulated that P. N. Pertamina will become Perussahaan Pertambangan Minjak Dan Gas Bumi Negara (Pertamina). Under these new regulations the central government will exercise greater control over the operation of this State enterprise.

Foreign nonoil investments approved by the Government between January 1967 and December 1971 totaled 444 projects with capital commitments up to $1.6 billion. Some of the largest projects deal with mineral exploration and development. So far about 180 companies have made applications for permits to look for minerals. At yearend, 14 foreign companies had signed agreements with the Indonesian Government to develop and exploit minerals, and six others were in the process of negotiating contracts. The following foreign companies have agreements for mineral development:

1. Freeport Indonesia Inc. (subsidiary of Freeport Sulphur Co. U.S.A.).
2. N. V. Billiton Maatschappij (The Netherlands).
3. P. T. International Nickel Indonesia (subsidiary of International Nickel Company of Canada Ltd. (Inco)).
4. P. T. Pacific Nickel Indonesia (Consortium of United States Steel Corp., U.S.A., Koninklijke Nederlandsche Hoogovens en Staalfabrieken, N. V., William H. Muller & Co., N. V., the Netherlands; Newmont Mining Corp., U.S.A.; Sherritt Gordon Mines, Ltd., Canada).
5. Aluminum Company of America (Alcoa, U.S.A.).
6. Indonesian Nickel Development Co., Ltd. (Consortium of Fuji Iron and Steel Co., Ltd.; Mitsubishi Shoji Kaisha, Ltd.; Mitsui & Co. Ltd.; Nippon Mining Co. Ltd.; Nippon Yakin Kogyo Co. Ltd.; Pacific

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[1] Mining engineer, Division of Nonmetallic Minerals.

Nickel Co. Ltd.; Sumitomo Metal Mining Co. Ltd.; Sumitomo Shoji Kaisha, Ltd.; and Yawata Iron & Steel Co. Ltd., Japan).

7. Overseas Mineral Resources Development Co., Ltd. (Japan, no longer active early in 1972).

8. P. T. Kennecott Indonesia (subsidiary of Kennecott Copper Corp., U.S.A.).

9. P. T. Riotinto Bethlehem Indonesia (Consortium of Rio Tinto-Zinc Corp. Ltd., England, and Bethlehem Steel Corp., U.S.A.).

10. The Broken Hill Pty. Co. Ltd. (Australia).

11. P. T. Asia Togor Mining Co. Ltd. (joint venture of P. T. Togor Corp. of Indonesia, Martupura Ltd., and Asia Mining Enterprises of Brunei).

12. P. T. Tropic Eneavour Indonesia (Australia).

13. P. T. Karimun Granite (joint venture of P. T. Indopling of Indonesia and Gammon Southeast Asia, Berhad, Malaysia).

14. P. T. Koba Tin (founded by Kajuara Mining Corp. Ltd., an Australian Consortium).

Most of Indonesia's production comes from Government-owned enterprises. Only one of the new nonoil mineral contractors has progressed to the development stage, however, the outlook is very promising. Freeport Sulphur's $130 million project for the exploitation of a copper deposit in West Irian is on schedule and mining will begin in January 1973. Inco has indicated discoveries of large laterite deposits with ores assaying 1.5 percent nickel. Pacific Nickel reported the discovery of 164 million tons of laterite ore containing 1.4 to 1.5 percent nickel. Alcoa announced a large bauxite find in Western Kalimantan during the year.

Mineral resources of Indonesia are far from being extensively exploited. Most of the present production comes from deposits discovered over 50 years ago and many have yet to be developed. The present mineral policy calls for the development of some of the known deposits. Also, hopes are high that new mineral discoveries will be made. Within the next 5 years, foreign investment in mineral development is estimated to be $750 million. Earnings from mineral exports are expected to double within the next 10 years.

PRODUCTION

Although there were no dramatic changes in mineral production over the past few years, the mineral industry of Indonesia has been stabilized and growing. In nonoil mineral production increases reflect improved mining operations. For 1971 as a whole, nickel production increased 50 percent, coal 15 percent, and gold 39 percent. There were also small increases in the production of silver and bauxite.

Petroleum production increases were the result of foreign participation in exploitation. During the first part of 1971, oil was being produced at a monthly rate of about 24 to 25 million barrels and at the end of the year, at a monthly rate of about 27 to 29 million barrels.

Dramatic changes are expected to take place within the next few years when some of the current mineral development projects begin production.

Table 1.—Indonesia: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1969	1970	1971 [p]
METALS			
Aluminum: Bauxite, gross weight	765,282	1,229,168	1,237,607
Gold, metal [2] troy ounces	[r] 7,928	7,608	10,600
Iron and steel, iron sand	NA	NA	270,900
Lead	NA	[e] 200	[e] 200
Manganese ore [3]	[r] 3,140	[r] 4,433	12,404
Nickel, mine output, metal content [e] [4]	7,624	18,000	27,000
Silver thousand troy ounces	[r] 341	283	285

See footnotes at end of table.

Table 1.—Indonesia: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity [1]	1969	1970	1971 [p]
METALS—Continued			
Tin:			
Mine output, metal content ____ long tons	17,138	18,761	19,411
Metal ____ do	5,900	5,108	[e] 9,260
NONMETALS			
Cement ____ thousand tons	[r] 535	553	544
Clays, kaolin powder [e]	2,500	9,500	9,500
Diamond:			
Industrial [e] ____ thousand carats	6	6	6
Gem [e] ____ do	14	14	14
Total [e] ____ do	20	20	20
Iodine [e]	1,000	1,000	1,000
Salt, all types ____ thousand tons	[r] 182	[e] 180	[e] 180
Sulfur, elemental [e]	1,200	1,500	1,600
MINERAL FUELS AND RELATED MATERIALS			
Asphalt rock, bitumen content [e]	12,000	18,300	31,300
Coal ____ thousand tons	[r] 192	172	198
Gas: Natural:			
Gross production ____ million cubic feet	[e] 110,000	[r] 108,561	120,627
Marketed ____ do	[e] 30,161	[r] 45,622	44,890
Natural gasoline ____ thousand 42-gallon barrels	NA	254	120
Petroleum:			
Crude ____ do	271,003	[r] 311,552	324,087
Refinery products:			
Gasoline ____ do	10,927	12,253	12,811
Kerosine and jet fuel ____ do	15,943	[r] 15,779	15,887
Distillate fuel oil ____ do	8,371	[r] 11,762	10,364
Residual fuel oil ____ do	12,926	[r] 12,418	14,099
Lubricants (including grease) ____ do	21	17	13
Other [5] ____ do	24,446	[r] 28,379	28,264
Fuel and losses ____ do	3,464	[r] 2,851	8,783
Total ____ do	76,098	83,459	90,221

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, a variety of crude construction materials such as clays, stone, sand and gravel are also produced but information available is inadequate to make reliable estimates of output levels.

[2] Officially reported Indonesian statistics representing Government output; private production by small unorganized producers may be as much as 30,000 troy ounces per year.

[3] Japan imports.

[4] Includes a small amount of cobalt which is not recovered separately.

[5] Includes unfinished oils requiring further processing.

TRADE

Mineral commodity exports remained important in Indonesian trade, contributing about 49 percent of the total value of 1971 exports. Petroleum alone is estimated to have acccounted for about one-third of all export earnings. Mineral commodity imports were limited to fertilizer, cement, and some asphaltic products.

Petroleum will continue to play an expanding role in exports in the next few years, with particularly good markets in Japan and increasing demand for Indonesian oil in the United States.

Since 1968, when the last of P. N. Timah's tin concentrate was shipped to Europe for smelting, there has been some shift in the marketing of Indonesian tin. Japan is now a more favorable place to market this product. The United States, however, is still the main market, having imported over 5,000 metric tons in 1971, of which 1,443 tons of metal came directly from Indonesia and the remainder from Malaya where most of P. N. Timah's concentrates are smelted.

Table 2.—Indonesia: Apparent exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum, bauxite	837,501	1,136,646	Japan 1,033,000; Italy 80,101.
Copper:			
Ores and concentrates	--	338	All to Japan.
Scrap	126	56	All to West Germany.
Iron and steel scrap	10,494	5,067	All to Japan.
Lead, alloys, unwrought	50	--	
Manganese ore and concentrate	3,140	4,433	All to Japan.
Nickel ore and concentrate	268,099	524,534	Do.
Tin:			
Ore and concentrate ______ long tons	62	506	Spain 329; Japan 177.
Metal, alloys, unwrought ______ do	7,250	7,096	France 1,803; West Germany 1,775; United States 1,360.
NONMETALS			
Fertilizers, crude ______ value, thousands	$88	--	
Salt ______ do	$78	--	
MINERAL FUELS AND RELATED MATERIALS			
Petroleum:			
Crude and partly refined:			
Crude thousand 42 gallon barrels	169,129	201,913	Japan 158,489; United States 26,157; Australia 17,267.
Partly refined ______ do	4,474	5,982	Japan 4,626; Australia 1,065; New Zealand 222.
Refinery products:			
Gasoline, motor ______ do	943	1,988	Japan 1,965; New Zealand 19.
White spirit kerosine ______ do	38	20	All to New Zealand.
Distillate fuel oil ______ do	13	--	
Residual fuel oil ______ do	20,282	22,914	Japan 21,438; Netherlands 1,475.
Mineral jelly and wax ______ do	110	190	Australia 124; Italy 22; Netherlands 17.
Other ______ do	5	--	
Total ______ do	r 21,391	25,112	

r Revised.

[1] Compiled from import data of Australia, Austria, Belgium-Luxembourg, Canada, Denmark, Finland, France, West Germany, Greece, Iceland, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom and Yugoslavia.

Source: The Statistical Office of the United Nations, 1969 Supplement to the World Trade Annual, V. 5 (The Far East), Walker and Company, New York 1971, pp. 316–320; 1970 Supplement to the World Trade Annual. V. 5 (The Far East), Walker and Company, New York 1972, pp. 262–267.

Table 3.—Indonesia: Apparent imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum:			
Oxide and hydroxide	35	1,063	Japan 1,001; France 62.
Metal, including alloys, all forms	4,760	5,395	Japan 4,231; Netherlands 564; Belgium-Luxembourg 236.
Copper, metal, including alloys, unwrought and semimanufactures	1,345	1,755	Japan 1,089; West Germany 366; United States 168.
Iron and steel:			
Metal:			
Scrap	--	324	All from Australia.
Pig iron and cast iron	515	1,375	West Germany 765; Australia 610.
Semimanufactures:			
Bars, rods, angles, shapes, sections	23,938	46,769	Japan 31,467; France 5,388; Belgium-Luxembourg 5,137.
Universals, plates, sheets	87,552	130,557	Japan 98,109; Australia 10,159.
Hoop, strip	3,317	9,153	Japan 8,605; West Germany 311; Australia 237.
Rails and accessories	10,018	6,986	Australia 3,344; United Kingdom 1,208; France 991.
Wire	32,768	38,876	Japan 27,477; Australia 9,818; West Germany 593.
Tubes, pipes, fittings	65,852	83,319	Japan 67,999; West Germany 5,955; France 2,356.
Castings and forgings, rough	150	124	Italy 67; Australia 57.
Total	223,595	315,784	

See footnotes at end of table.

Table 3.—Indonesia: Apparent imports of selected mineral commodities[1]—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS—Continued			
Lead:			
Oxides	115	266	Netherlands 105; West Germany 90; United Kingdom 71.
Metal, alloys, unwrought	--	288	Japan 163; Australia 125.
Manganese oxides	165	325	All from Japan.
Nickel, metal, semimanufactures	--	7	All from West Germany.
Tin, metal, including alloys, unwrought long tons	52	29	Japan 17; United Kingdom 12.
Titanium oxides	154	776	Japan 515; Belgium-Luxembourg 116; West Germany 94.
Zinc:			
Oxides	105	124	All from West Germany.
Metal, including alloys	1,707	5,162	Australia 2,679; Japan 1,881.
Other:			
Ash and residue containing nonferrous metals	237	--	
Oxides, hydroxides and peroxides of metals, n.e.s	39	18	All from United States.
NONMETALS			
Abrasives, natural, grinding and polishing wheels and stones	51	74	All from West Germany.
Asbestos	--	136	All from Australia.
Barite, and witherite	3,499	24,609	United States 15,799; Australia 8,810.
Cement	339,166	435,827	All from Japan.
Clays and products:			
Crude clays, n.e.s	4,408	1,806	Do.
Products value, thousands	$492	$1,425	Japan $731; France $167; Italy $159.
Fertilizer materials:			
Crude do	$1,224	$1,718	Australia 467; West Germany 374.
Manufactured:			
Nitrogenous	124,127	105,632	Japan 84,998; Netherlands 17,455; Belgium-Luxembourg 2,999.
Phosphatic	41,692	7,447	Japan 6,444; United States 1,003.
Potassic	32,937	23,310	West Germany 8,522; France 8,103; Belgium-Luxembourg 4,309.
Mixed	130,406	12,467	West Germany 8,279; Japan 2,870; Belgium-Luxembourg 1,318.
Total	329,162	148,856	
Gypsum and plasters value, thousands	$89	$43	All from Australia.
Limestone	2,341	3,224	All from Japan.
Precious and semiprecious stones, n.e.s. value, thousands	$104	$169	West Germany $168.
Sodium compounds:			
Caustic soda	15,404	20,809	West Germany 7,872; United States 4,787; Japan 4,320.
Sulfur:			
Elemental	4,596	13,512	France 12,000; West Germany 1,512.
Sulfuric acid	449	--	
All nonmetals n.e.s.:			
Crude	1,846	5,624	All from West Germany.
Building materials of asphalt, asbestos, and fiber cement, and unfired nonmetals, n.e.s	2,849	2,425	Belgium-Luxembourg 2,046; Japan 379.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	677	1,412	Australia 710; Japan 318; United States 197.
Coal	10,000	6,556	All from Australia.
Coke	6,755	398	All from West Germany.
Petroleum refinery products:			
Kerosine thousand 42 gallon barrels	368	--	
Distillate fuel oil do	--	10	Australia 7; Japan 3.
Residual fuel oil do	142	266	All from Japan.
Lubricants do	2	41	Netherlands 25; United Kingdom 15; West Germany 1.
Mineral jelly and wax do	6	13	West Germany 6; Netherlands 5; United States 2.
Other do	[r] 745	689	Japan 678; United States 8.
Total do	1,263	1,019	

[r] Revised.

[1] Compiled from export data of Australia, Austria, Belgium-Luxembourg, Canada, Denmark, Finland, France, West Germany, Greece, Iceland, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and Yugoslavia.

Source: Statistical Office of the United Nations, 1969 Supplement to the World Trade Annual. V. 5 (The Far East), Walker and Company, New York 1971, pp. 321–334; 1970 Supplement to the World Trade Annual. V. 5 (The Far East), Walker and Company, New York 1972; pp. 268–285.

COMMODITY REVIEW

METALS

Aluminum.—Three Japanese aluminum producers, Showa Denwo Co. Ltd., Sumitomo Chemical Co. Ltd., and Nippon Light Metal Co. Ltd., have completed a joint survey of bauxite deposits on Bintan Island. A feasibility study for building a $116 million alumina plant at Watjopek on Bintan Island was also submitted by the consortium. The capacity of the proposed plant is 400,000 tons. In association with P. N. Aneka Tambang, the State-owned General Mining Enterprise, 78 million metric tons of bauxite ore have been delineated in the last 3 years of exploration. The largest ore body at Watjopek has ore reserves of 27 million metric tons. Bauxite ores presently being exported to Japan from Bintan analyze 50 percent Al_2O_3 and 4 percent SiO_2. Starting in 1971 exports to Japan were raised to 1 million metric tons per year. This is an increase of 200,000 tons annually over previously contracted sales. The present contract is valid for 8 years.

In 1969 Alcoa signed an agreement with the Government to explore a 400,000 square kilometer area. Alcoa subsequently announced the discovery of a large bauxite deposit in West Kalimantan. Alcoa, Kaiser Aluminum and Chemical Corp., Reynolds Metals Co., and others including a Japanese-American consortium have discussed with the Government the possibility of building power and aluminum facilities in connection with the $200 million Asahan Dam project in Northern Sumatra. Bids have been invited for the construction of an aluminum reduction plant with a planned capacity of possibly 200,000 metric tons annually which would eventually be expanded to perhaps 360,000 tons.

With the discovery of such large bauxite deposits, some discussion has taken place on the eventual need for building another aluminum plant and the possible use of Bukit Asam coal as the fuel for power generation.

Copper.—Thirty-five years ago in what was then known as Netherlands New Guinea, now West Irian, Dr. Joan Jacques Dozy discovered the Ertsberg copper deposit in the Carstensz Mountains. In 1967 Freeport Sulphur Co., operating as Freeport Indonesia Inc., received the rights to explore and develop this deposit, as well as a surrounding area of 100 square kilometers. Extensive exploratory drilling and engineering studies over a period of more than 2 years uncovered ore reserves of about 30 million tons of 2.5 percent copper ore. The $130 million project includes the mill, laboratory, maintenance and supply systems, a powerplant, port, airstrip, access road, and townsite. The 120-kilometer access road will be a masterful piece of engineering, traversing through mangrove swamp jungle and mountain terrain to the townsite and mine. Production is expected to commence early in 1973. Mining will start at an elevation of 3,500 meters. The outcrop will be strip-mined for the first 8 to 10 years, followed by underground mining of the remainder of the deposit. After primary crushing at the mine, a conveyor belt and aerial tramway will deliver the ore to the mill at 2,600 meters. The concentrates will be delivered in a slurry form through a 4-inch pipeline along the access road to the port.

Long-term contracts for the entire output of copper concentrates have been made with firms in Japan and West Germany, which have advanced considerable funds for the development of the Ertsberg deposit. The Japanese have contracted to import 40,000 tons of concentrates and the Germans about 25,000 tons.

Gold.—The Tjikotok and Tjirotan gold-silver mines in Java together produced about 40,000 metric tons of ore. At the present rate of production, the mines have ore reserves sufficient for about 10 years of operation. Exploration is underway to develop additional reserves. However, the gold veins contain an increasing percentage content of lead and zinc with depth.

The dredging operation at the Logas mine on the Sangingi River in central Sumatra was about to shut down. The average grade of the dredged material was only 125 milligrams of gold per cubic meter, and this was not rich enough for a profitable operation.

The Wattle Gully Gold Mines N. L., and Nickelfields N. L., of Australia have negotiated a joint venture to exploit a part of an alluvial gold deposit adjacent to the Torentz River in West Irian. The rights to this area has been held by Nickelfields in the past.

Iron and Steel.—Although more than 100 iron deposits have been found in the country, not one is extensive, high grade, or favorably located to be exploited economically. The only output of iron so far has been from a beach sand deposit at Tjilatjap. The titaniferous iron sands were considered at one time as a possible source of raw material for the proposed 100,000-ton annual capacity steel plant at Tjilegon, West Java. Ore reserves total about 3 to 4 million tons in terms of finished concentrates, with the crude sands analyzing about 14 percent iron. Production started in May 1971 and a concentrate analyzing 55 to 58 percent iron and 7 to 8 percent titania is produced. P. N. Aneka Tambang has a contract with Japan to ship 300,000 tons of this iron concentrate annually for the next 10 years. In 1971, 270,900 tons of iron sand concentrates were shipped to Japan. Mining is done hydraulically, followed by wet magnetic separation. Concentrates are loaded into 30,000-ton ore ships by a conveyor belt. Development cost for this project was about 4 million dollars, most of which went into dredging and blasting in connection with the development of a deep water channel. A much larger beach sand deposit, about 120 kilometers south of Tjilatjap and known as Jogjakata, was being considered for development. Preliminary exploration showed more than 40 million tons of exportable iron sand concentrates. However, harbor conditions are more difficult than those encountered at Tjilatjap.

Kawasaki Steel Corp. of Japan in a joint venture with an Indonesian company plans to construct a steel fabrication plant in Surabaja, East Java. The new company called P. T. Steel Pipe Industry of Indonesia is scheduled to produce 18,000 metric tons of steel pipe per year.

Following an economic cooperation agreement signed with the Soviet Union in 1970, the Indonesian Government negotiated a survey contract in July to have the Soviets investigate the feasibility of resuming construction of the abandoned Tjilegon Steel Project. Some 28 Soviet experts together with Indonesian engineers were scheduled to examine the condition of the machinery and equipment of the stalemated project. The results of the survey will be the basis for future meetings to discuss continuation of Soviet construction projects, which also include a superphosphate plant and a thermal powerplant.

A new galvanizing plant is proposed to be constructed on a joint basis by the Japanese trading company, Nichimem Jitsugyo and a local company, FA Indenix. The new company, Kalimantan Steel Co. with a capital of $700,000 will be financed on a 50/50 basis. The galvanizing line will have the capacity of 1,000 tons per month. The plant is scheduled to start operations in the spring of 1972. Demand for galvanized products has been placed at 70,000 to 80,000 tons per year. Japanese interests are already involved in six galvanizing ventures in Indonesia and the new company is expected to be the last of such projects.

Indonesian Steel Tube Works, made up the Japanese firms Nissho-Iwai Co. Ltd., (50 percent), Maruichi Steel Tube Works Ltd., (10 percent), and Indonesian interest (40 percent), plans to construct a 1,000-ton-per-month steel tube plant at Semarang, Central Java. Production is scheduled to start early in 1972.

Mercury.—The Australian firm of Nickelfields has acquired a 75-percent interest in five mercury leases in West Kalimantan from Firina Dpanegara Corp. of Djakarta. The alluvial deposits reportedly contain over 3 million cubic yards of mercury-bearing ore.

Nickel.—Nickel mining in Indonesia, in the Pomalaa area of southeastern Sulawesi, Celebes has been controlled by the State enterprise P. N. Aneka Tambang. Semimechanized selective strip mining methods have been employed with some use of hand picks and shovels. The blended ores prepared for shipment contain 2.4 percent combined nickel-cobalt. Reserves of high-grade ore are limited and export shipments are not expected to last beyond the next 3 years. P. N. Aneka Tambang was making a feasibility study for the construction of a ferronickel plant at the mine site which would utilize low-grade nickel ores. Annual capacity of the plant under consideration is 4,000 metric tons of contained nickel in the form of ferronickel.

Under the new mineral development program, P. T. International Nickel Indonesia was undertaking exploration in the southeast and east Sulawesi area; P. T. Pacific Nickel Indonesia near the Sentani area, Waigeo Island, West Irian; and P. N. Indonesian Nickel Development Company in the Halmahera Archipelago area.

Exploration which P. T. International Nickel Indonesia started in 1968 has uncovered significant deposits of lateritic nickel in the Sorokao area of Sulawesi. More than 1,900 exploratory holes aggregating about 15,000 feet were drilled. Construction work will begin after a study covering engineering, marketing, financial, and processing arrangements are completed. The first stage of development would be designed to produce some 50 million pounds per year of contained nickel in the form of matte. Official development costs will be made after completion of the study currently on hand. Preliminary estimates put the overall development costs at $200 million. Financing arrangements have not been worked out yet, but talks have been held with Japanese interests for a possible joint venture. Regardless of whether or not this materializes, Inco would construct, operate, and manage the project through a subsidiary.

Pacific Nickel Indonesia indicated that they may invest $240 million in a nickel mining project at Waigeo, West Irian. The deposit is reported to have 164 million tons of ore analyzing 1.4 to 1.5 percent nickel and 0.16 to 0.17 percent cobalt. To date, 12,000 tons of this ore have already been shipped to Sherritt Gordon Mines' plant at Fort Saskatchewan, Alberta, Canada for metallurgical testing.

Tin.—The tin industry controlled by the State enterprise, P. N. Tambang Timah, continued to make progress in its rehabilitation and expansion program. Production comes from about 130 workings on and off the Islands of Bangka, Belitung, and Singkep. Most of the output comes from dredging offshore. Land operations have been characterized primarily by hydraulic open pit mining of alluvial deposits. Small amounts of primary ore are also mined. Exploration was underway to evaluate the feasibility of mining more primary ores.

Dredging offshore accounted for 60 percent of production in 1971. There were 24 dredges ranging in size from 14 to 18 cubic feet capacity. The maximum mining depth of any dredge was 40 meters. After preliminary benefication on the dredge, the crude concentrate is upgraded to 68 to 72 percent tin onshore. The ore dredged ranges in size from 48 to about 200 mesh. Recovery of tin has been only up to 150 mesh with the remainder lost in slimes, estimated to be as much as 20 percent of the tin originally in the ground. This has been a long-standing problem, however. During the year P. N. Timah continued to conduct its exploration program to locate and evaluate new tin reserves offshore. The objective is to prove adequate reserves to support production until the year 2000. This program, initiated in April 1970, will take 8 years to complete and the total cost is expected to be in excess of $5 million. Sesco N. V., Coastal Engineering Survey Consultants, a Netherlands firm has been contracted to do the initial work.

Specifically the exploration program will be carried out in four major steps: reconnaissance surveys, scout surveys, detailed surveys, and drilling for reserves. P. N. Timah's 33,000-square-kilometer offshore concession will be delineated into ores of "possible interest," "special interest," and "great promise." All told, about 3,000 holes are expected to be drilled in the exploration program.

P. N. Timah's rehabilitation program is not moving along as rapidly as originally planned. Of the $47 million aid requested, only $7 to $8 million have been committed thus far by the donor nations. Time schedules have been set up for the rehabilitation of P. N. Timah dredges and other equipment; but the rate at which aid has been received has already delayed the program about 2 years. To date only one dredge has been rehabilitated. Since P. N. Timah has not found the flow of foreign aid rapid enough for this program, they are using internal funds for rehabilitation and expansion.

One of the 14-cubic-foot bucket dredges called Maras sank at sea because a mechanical breakdown of the bucket line had torn a hole in its side.

Tin smelting in Indonesia, at Muntok on the Island of Bangka, does not employ the conventional reverberatory shaft furnace but rather a rotary furnace designed by the West Germans which never worked well. Therefore, the Indonesians are planning to install two conventional stationary furnaces and raise effective capacity of the Muntok tin smelter from about 13,000 to 27,000 tons of tin metal per year. The cost of the project is estimated at about $1.5 million and construction was to start in 1971.

Foreign participation in tin mining has been limited with only two firms having signed agreements so far. In 1968 N. V. Billiton Maatschappij of the Netherlands signed an agreement to explore the offshore and land areas of Tudjuh Islands, east of Sumatra, and the offshore land areas of Karimata Island southwest of Kalimantan. Subsequently, the Broken Hill Pty. Co., Ltd., of Australia made a $2 million agreement to explore and develop tin mining on the Island of Belitung off southern Sumatra, stipulating in the contract a 7 year preproduction stage and a 30-year mining period.

Colonial Sugar Refining Co. Ltd., Blue Metal Co. Ltd., and the Ready Mixed Concrete Co. have entered into a joint venture with an Indonesian Company, P. T. Koba Tin to work mining leases for tin and associated minerals on Bangka Island.

NONMETALS

Barite.—The barite plant of P. T. Dresser Magcobar Indonesia, a subsidiary of the U.S. firm Dresser Industries, Inc. was inaugurated late in 1971. The plant located on Batam Island, just south of Singapore, has a production capacity of about 45,000 short tons per year of barite suitable for use as drilling mud. The plant reportedly was built at a cost of $1.5 million.

Cement.—Kaiser Cement and Gypsum Corp. acquired a 51-percent equity in P. T. Semen Tjibinong (Tjibinong Cement Co.) in 1971 and immediately made plans to build a 550,000-ton cement plant at Tjibinong, 30 miles south of Djakarta. Construction was scheduled for early in 1973.

Padang Cement's plant at Indarung in western Sumatra was expected to be expanded from 150,000 to 220,000 tons of cement annually. P. N. Padang Cement and P. R. Tasindo jointly have made plans to build a cement grinding mill at Belawan in northern Sumatra, with clinker to be supplied by Padang Cement.

In September 1971 construction was started on another grinding plant at Belawan by a joint venture between P. T. Sumatra Cement Ltd., a Singapore firm, and P. T. Sumber Wangi, a domestic company. Completion of this plant was scheduled for September 1972. A clinker plant was also being built at Bohorok of the Langkat district, about 90 kilometers from Belawan. When this plant is completed in 1974, it will be capable of producing 400,000 tons per year, but until the Bohorok plant is completed, clinker for the Belawan grinding plant will be imported.

The Central Java Provincial Administration in a joint venture with an Australian firm plans to build a cement plant at Pamotan near Rembang with a capacity of 7,500 tons per day.

The Gresik Cement Co. was installing an 11- by 375-foot rotary kiln at its plant in Surabaja in eastern Java. When the kiln is completed in May 1972, capacity of the cement plant will be increased from 375,000 to 500,000 tons per year.

Diamond.—The diamond dredging operation in the Simpang Ampat area 30 kilometers north of Marapura in Kalimantan was no longer profitable and plans were underway to shut it down. Local people are still engaged in hand-panning for diamond with some success. However, most of the diamond produced by these crude methods left the country unreported.

Fertilizer.—The Medan-Belawan area will soon have a $17 million fertilizer plant which is proposed for construction by 1972. The plant will be built by a joint venture between Waagner Bureau A.G. of Australia and the Australian construction Co. Ltd. The Australian firm is providing $12 million of the capital, which represents the largest single Australian investment in Indonesia so far.

MINERAL FUELS

Asphalt.—P. N. Pertamina opened an asphalt plant at Pladju near Palembang, South Sumatra, in 1971. The plant reportedly built at a cost of $600,000, has an annual capacity of about 60,000 tons. The present need for asphalt in Indonesia is about 200,000 tons per year; 70 percent of this tonnage is produced domestically and most of the remainder is imported from Japan.

Except for a small amount of crude oil from the Tarakan field, the crude oil used for asphalt extraction by P. N. Pertamina originates primarily in the Middle East. Most of the imports come from Kuwait, which has crude oil of asphaltic base, and high in sulfur. Indonesian crude, with its lower sulfur content, is used primarily for the production of gasoline either in Indonesia or Japan.

Coal.—Although Indonesia has workable coal deposits, demand for coal has declined because of the extensive resources of oil. In fact, petroleum products are increasingly being substituted for coal. Indonesia's known coal deposits with reserves measuring in hundreds of millions of tons are found mainly in Sumatra and Kalimantan. There are also lesser deposits in Java, Sulawesi, and West Irian. Only two unprofitable coal mines, Bukit Asam and Ombilin on Sumatra, run by the State Enterprise P. N. Tambang Batubara are still in operation. The Mahakam mine on Kalimantan was closed down in May 1971.

The "Basic Agreement" concluded in 1970 between P. N. Tambang Batubara, Marubeni-Iida Co. Ltd. of Japan, and Kaiser Steel International Corp. of the United States required Marubeni-Kaiser to complete a detailed feasibility study of the Ombilin coal deposit by late 1971. Following this, if both parties are agreeable, a "contract of work" would be signed.

Petroleum.—Petroleum exports increased 20 percent in 1971. Export value of petroleum and petroleum products in 1971 was $541 million. In March, the price of crude oil increased 51 cents per barrel, which in turn increased the price of crude oil exported to Japan to $2.21 per barrel.

Five additional foreign investment "production sharing" contracts signed during 1971 called for a combined $83 million exploration expenditure. There were about 26 operating oil companies engaged in "production sharing" contracts with P. N. Pertamina by yearend 1971. At least three of these companies already have announced encouraging finds offshore. Several firms have enormous exploration areas, with Phillips Petroleum Co. of Indonesia, having the largest of all concessions—325,000 square kilometers off the coast of West Irian.

Shell signed an oil production-sharing contract January 15, for a 9,000-square-kilometer area off southern Java. Under the contract, Shell paid the Indonesian Government $4 million bonus for the area and agreed that the profit-sharing ratio would go up to 70/30 in P. N. Pertamina's favor when production reaches 200,000 barrels per day.

A new contract was signed with Continental Oil Co. of Indonesia during the fourth quarter of 1971, calling for exploration expenditures of $17.5 million. This brings the total of such required expenditures in the oil sector by all foreign investors to $497 million.

Atlantic Richfield Indonesia Inc. (ARCO), first company to sign an offshore contract with P. N. Pertamina, also will be the first to get into full production. The company has spent $30 million in exploration in their 74,000-square-kilometer block and plans to spend $60 million more to get the oil out. Production is expected to reach 75,000 barrels per day by the end of 1972.

Union Oil Co. of Indonesia, announced that the Attaka field will go into production in 1972 at an initial rate of 30,000 barrels per day. The total cost for building this production complex is reported to be about $100 million. The Attaka field will be the third offshore production complex to go into operation.

P. T. Caltex Pacific owned by Standard Oil of California and Texaco, has discovered three new oilfields that are potential sources of low-sulfur Minas-type crude oils. Two of the newest fields, Petapahan and Surman, are about 15 miles west of the Kotabatak field. The Kotabatak field, also a new field, started producing in July. The third new field, Sintong, is located along a pipeline route being built from Bangko, South Balam, and Menggala fields that were discovered earlier and are being prepared for development. Production of 180,000 barrels per day from the Bangko field is expected to begin early in 1973. By yearend Caltex was in the midst of a major expansion and investment program to raise production in established fields and locate new reserves by reevaluating their entire region. They were also acquiring additional onshore and offshore contract areas throughout Indonesia. At present Caltex holds 25.5 million acres onshore and offshore, including 5.5 million acres in production-sharing contracts granted at the time agreements were extended on older acreage. In 1972 they plan to drill their first offshore well north of the Island of Bali. Caltex production is expected to reach 1 million barrels per day in 1972. Present production is about 750,000 barrels per day.

In September the Puteri Tudjuh refinery at Dumai Central Sumatra was inaugurated. In 1967 P. N. Pertamina signed a $34 million contract with two Japanese firms—Far East Trading Company and Sumitomo Shoji Kaisha—to build a 100,000-

barrel-per-day refinery and port facilities. The first stage of the refinery, 24-tank, auxiliary-power, cooling, and communications facilities and a crude distillation topping unit were completed during 1971. The second stage is expected to be completed by 1973.

On August 23, the Indonesian Parliament passed the Oil and Natural Gas Law (Government Regulation No. 72). Some of the more important provisions of this law are as follows:

1. All P. N. Pertamina's expansion programs related to oil and gas operations are subject to approval by the President.
2. P. N. Pertamina's income will be divided between P. N. Pertamina and the State Treasury.
3. Outlining of taxation rates and schedules between P. N. Pertamina and foreign oil contractors.
4. Establishment of a Board of Supervisors for P. N. Pertamina, consisting of the Minister of Mining, Minister of Finance, and the Chairman of the National Planning Board.

The Mineral Industry of Iran

By David A. Carleton [1]

The mineral industry of Iran advanced considerably in 1971 and is now on the threshold of an expansion program that could contribute considerably to the national economy. Petroleum and natural gas production and processing increased at a rapid pace, and new concessions covering promising areas were let to major international oil companies. The metal and nonmetal sector of the mineral industry, although small and relatively undeveloped compared with the petroleum and natural gas sector, has been broadening its base in recent years. The Geological Survey of Iran is at present systematically prospecting for all kinds of minerals in the northeast and northwest provinces. In addition mineral exploration is being performed by the National Iranian Oil Co. (NIOC), the National Iranian Steel Co., both of which are government entities, and by indigenous and foreign private enterprise. As a result, several important deposits of copper, iron ore, and lead-zinc have been discovered. However, there is the continuing need for an even broader program that would adequately cover the entire country.

The value of mineral production increased about 40 percent from roughly $2 billion [2] in 1970 to about $2.8 billion in 1971. During the year, the value of crude oil production, which accounts for 94 percent of the value of mineral production, rose because of production and price increases. This was greatly influenced by the accord reached in Tehran between officials of the Organization of Petroleum Exporting Countries (OPEC) and the representatives of the major foreign producing companies. The agreement increased the posted price (that which is used to compute taxes and royalties) for an average barrel Iranian crude oil of 34° API gravity, from $1.79 to $2.27. For the first time natural gas has become a major item of mineral production, which is the result of large volumes of gas exports to the U.S.S.R. The contribution of the petroleum sector to government income increased substantially to $1.9 billion in 1971 or 32 percent of the total government income, compared with $1.2 billion in 1970. Accordingly, the mineral industry contributes about 25 percent to the nation's gross national product (GNP) of $12.1 billion.

The large jump in petroleum sector receipts produced a record $485 million balance of payments surplus in the Iranian year 1350 (March 21, 1971 through March 20, 1972). Foreign exchange income reached more than $2.7 billion, permitting a 16-percent rise in imports, a sizable increase in foreign exchange reserves, and a reduction in the 1350 budget deficit. Reflecting the petroleum industry's strong position, Iran's gross foreign exchange reserves climbed dramatically in the Iranian year 1350 to $790 million, an amount almost three times greater than that held the previous year.

The output of minerals other than crude oil and natural gas totaled $105 million during the Iranian year 1350, up 50 percent from that of the previous year. In keeping with previous trends, cement production contributed 75 percent of the total, followed by lead-zinc ores (11 percent) and coal (4 percent).

Major mineral industry developments, other than the settlement on new posted petroleum prices previously mentioned, included the near completion of the new steel mill at Isfahan, nationalization of the Sar Cheshmeh copper deposit near Kerman, the discovery of Ardeshir oilfield in the Persian Gulf, the issuance of three major joint-venture concessions (two offshore, one onshore), the signing of a construction contract for the Middle East's largest ($358 million) petrochemical plant at Bandar Shahpur, and an agreement to exploit iron ore at two deposits in southern Iran.

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[1] Supervisory foreign mineral specialist (petroleum), Division of Fossil Fuels.

[2] Where necessary, values have been converted from Iranian Rials (Rs) to U.S. dollars at the rate of Rs 1=US$0.0132.

PRODUCTION

On December 31, 1971, the Aryamehr steel plant at Isfahan was placed on trial production by producing Iran's first pig iron. Because of the need to stockpile raw materials at the plant, the production of iron ore, coal, and limestone rose substantially. In addition, the high level of construction activity is reflected in the 63-percent increase in cement production. These four mineral commodities accounted for most (87 percent) of the rise in the value of nonpetroleum industry output, which rose from $68 million in 1970 to $105 million in 1971. Crude petroleum and marketed natural gas production in 1971 were valued at $2.6 billion and $66 million, respectively.

Table 1.—Iran: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1969 [2]	1970 [2]	1971 ^{p} [2,3]
METALS			
Chromium, chromite, gross weight	^{r} 118,300	^{e} 180,000	^{e} 175,600
Copper:			
Mine output, metal content ^{e}	^{r} 800	^{r} 250	600
Smelter output ^{e}	500	100	500
Iron ore, gross weight	^{r} 7,400	10,000	150,000
Lead:			
Mine output, metal content	^{r} 32,800	^{r} 47,000	38,800
Smelter ^{e}	180	180	180
Manganese ore, gross weight	^{r} 21,000	9,144	12,820
Zinc, mine output, metal content ^{e}	^{r} 21,600	^{r} 41,500	39,200
NONMETALS			
Barite	^{r} 77,700	77,000	60,000
Cement, hydraulic thousand tons	2,342	2,575	4,200
Clays:			
Bentonite	NA	12,000	13,000
Kaolin	^{r} 42,350	45,000	48,000
Gem stones, turquoise, crude	300	^{e} 300	NA
Gypsum thousand tons	^{r} 1,940	2,100	2,250
Lime ^{e} do	1,000	1,000	1,100
Magnesite	21,000	20,000	21,000
Mineral pigments, natural, ocher	^{r} 5,100	8,000	4,600
Salt, rock	^{r} 387,400	390,000	390,000
Stone, sand and gravel:			
Limestone thousand tons	3,180	4,000	4,500
Marble do	10	12	15
Silica do	33	35	36
Strontium minerals, celestite	NA	300	300
Sulfates, natural:			
Alum (aluminum-potassium sulfate)	^{r} 6,000	6,500	7,000
Sodium sulfate (mineral not specified)	8,900	9,000	NA
Sulfur:			
From ores (refined)	^{r} 1,800	1,900	2,000
Elemental, byproduct	^{r} 87,000	^{e} 412,000	^{e} 500,000
MINERAL FUELS AND RELATED MATERIALS			
Coal thousand tons	^{r} 390	530	600
Coke do	^{r} 51	54	57
Gas, natural:			
Gross production million cubic feet	892,583	1,094,194	1,305,228
Marketed production do	98,201	396,333	551,330
Petroleum:			
Crude (net) [4] thousand 42-gallon barrels	1,232,155	1,397,460	1,661,901
Refinery products:			
Gasoline, aviation do	6,475	5,752	5,361
Gasoline, motor do	16,998	18,718	20,809
Jet fuel do	13,428	12,743	10,776
Kerosine do	19,682	18,338	19,683
Distillate fuel oil do	29,831	33,160	36,297
Residual fuel oil do	76,842	84,127	88,084

See footnotes at end of table.

Table 1.—Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity[1]	1969[2]	1970[2]	1971[p][2][3]
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Refinery products—Continued			
Lubricants thousand 42-gallon barrels	560	560	560
Other:			
Naphtha and solvents do	4,934	4,438	2,718
Asphalt do	2,243	2,165	2,662
Liquefied petroleum gas do	930	1,310	913
Unspecified do	11,619	13,652	14,172
Refinery fuel and losses do	7,085	5,802	6,673
Total do	190,627	200,765	208,708

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, other types of crude construction materials such as common clays, sand and gravel and additional varieties of stone are also produced, but output is unreported, and available information is inadequate to make reliable estimates of output levels.

[2] Data presented are for the Iranian calendar year beginning March 21 of the year stated except for figures on natural gas and petroleum, which are for regular calendar years.

[3] A number of figures given for 1971 differ from those in commodity chapters in Volume I of the 1971 edition of the Minerals Yearbook owing to receipt of new data subsequent to the preparation of the commodity chapters.

[4] Excludes petroleum reinjected into the fields.

TRADE

Under the terms of the new Irano-Romanian trade pact signed on September 29, 1971, Romania agreed to import 1.9 million tons (approximately 38,000 barrels per day) of Iranian crude oil during 1972. The new agreement calls for the continuation of oil exports to Romania at the level of earlier years, but with one difference, Iran is to receive 25 percent of the value of the oil in negotiable foreign exchange. The latter is a deviation from the normal pattern of barter arrangements with East European countries.

Major items of export in 1971 were crude oil (1,451.7 million barrels), refined products (110.7 million barrels), and natural gas (198.5 billion cubic feet). Based on preliminary data, Iran was the world's second largest exporter of crude oil (after Saudi Arabia) and the third largest exporter of natural gas (following Canada and the Netherlands). Natural gas exports, all of which went to the U.S.S.R., averaged 782.0 million cubic feet per day during December 1971.

Table 2.—Iran: Exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum:			
Bauxite	1,500	--	
Metal, including all forms	19	22	All to Afghanistan.
Chromium, chromite, 48 percent Cr_2O_3	145,300	222,463	France 42,800; United States 35,850; Netherlands 34,000.
Copper ore and concentrate	3,000	1,500	All to Japan.
Iron and steel:			
Scrap	14,646	23,975	People's Republic of China 23,800; Pakistan 149.
Semimanufactures	3,403	648	Kuwait 488; Afghanistan 110.
Lead ore and concentrate	66,637	89,468	U.S.S.R. 59,983; Japan 11,800; Poland 5,600.
Manganese ore and concentrate	950	9,144	All to West Germany.
Tin ore and concentrate long tons	57	--	
Zinc ore and concentrate	53,233	96,629	Japan 35,000; West Germany 16,000; Belgium 14,670.
Other:			
Ore and concentrate	1,075	5,880	Kuwait 3,000; Japan 2,000; Oman 880.
Ash and residues containing nonferrous metals	40	120	All to U.S.S.R.

See footnotes at end of table.

Table 2.—Iran: Exports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
NONMETALS			
Barite, natural	4,212	8,452	Oman 3,432; Dubai 2,673.
Cement	34,352	96,991	Kuwait 65,806; Oman 30,160.
Chalk	193	49	Dubai 36; Afghanistan 7.
Clays, crude n.e.s.:			
Bentonite	3,942	761	All to Dubai.
Fuller's earth	12	12	Dubai 6; Kuwait 4.
Other	658	3,536	Kuwait 2,000; Dubai 816.
Fertilizer materials:			
Nitrogenous	3	73	Qatar 39; Kuwait 34.
Phosphatic	12	--	
Gypsum	843	1,851	Kuwait 1,555; Dubai 255.
Lime	2,517	--	
Pigments:			
Ochre	8,467	7,653	France 5,000; India 2,278; United States 325.
Other earth colors	1	--	
Precious and semiprecious stones:			
Turquoise grams	292,843	8,000	All to United States.
Other do	--	328,000	All to India.
Pumice	2	--	
Salt	2,719	4,164	Kuwait 2,638; Oman 1,021.
Stone:			
Dimension:			
Alabaster	148	350	Kuwait 250; Republic of South Africa 100.
Marble	[r] 12,101	18,209	Italy 11,818; West Germany 2,784; Japan 1,727.
Other	13,530	6,624	Kuwait 3,102; Japan 1,765; West Germany 745.
Crushed	27,833	29,341	Kuwait 24,736; Oman 3,620; Dubai 638.
Sulfur	5,000	139,332	Republic of South Africa 102,282; Taiwan 24,000; Singapore 9,300.
Other nonmetals n.e.s	6	--	
MINERAL FUELS AND RELATED MATERIALS			
Coal	114	85	All to Asia.
Petroleum: [2]			
Crude oil thousand 42-gallon barrels	991,797	1,089,552	Asia 646,347; Europe 317,682; Africa 80,029.
Refinery products:			
Gasoline, aviation do	9,631	7,543	Asia 3,691; Europe 1,928; Africa 1,272.
Gasoline, motor do	16,067	17,919	Asia 6,794; Africa 5,580; Europe 2,691.
Jet fuel do	9,540	9,191	Asia 4,836; Africa 1,984; Europe 1,157.
Kerosine do	5,702	6,558	Africa 3,591; Asia 2,314; Europe 406.
Distillate fuel oil do	12,715	15,404	Asia 7,028; Africa 6,718; Europe 1,474.
Residual fuel oil do	65,573	74,177	Asia 48,672; Europe 15,908; Africa 6,596.
Lubricants do	10,277	7	All to Asia.
Other:			
Solvents do	272	1,085	Africa 643; Asia 367; Europe 70.
Asphalt do	613	407	Ethiopia 299; Asia 108.
Unspecified do	4	5	All to Asia.
Total do	130,394	132,296	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	8,674	--	

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[r] Revised.

[1] Data are for Iranian calendar years beginning March 21 of the year indicated.

[2] Destinations of shipments reported by continent only, detail by country not available, except for primary shipment of asphalt to Ethiopia.

Table 3.—Iran: Imports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum:		
Oxide	316	185
Metal, including alloys:		
Scrap	1,525	1,374
Unwrought	7,592	3,480
Semimanufactures	4,521	6,597
Antimony, metal and alloys	115	66
Arsenic oxide and acid	36	28
Cadmium, metal and alloys kilograms	1,853	666
Chromium oxide	40	11
Cobalt, metal and alloys kilograms	589	368
Copper metal, including alloys:		
Scrap	56	162
Unwrought	83	38
Semimanufactures	9,058	10,789
Gold, metal:		
Including scrap and waste troy ounces	97,481	96
Rolled, drawn, sheets and bars do	193	611
Iron and steel:		
Ore	1	132
Metal, including alloys:		
Cast iron	23,741	7,612
Ferroalloys	1,312	959
Scrap	3,843	7,686
Unwrought	43,247	218,177
Semimanufactures thousand tons	1,109	1,009
Lead:		
Oxide	1,436	529
Metal, including alloys:		
Scrap	1	7
Unwrought	4,487	4
Semimanufactures	62	33
Magnesium metal, including alloys	(2)	7
Manganese oxide	800	650
Mercury 76-pound flasks	r 275	9
Nickel metal, including alloys:		
Scrap	3	(2)
Unwrought	7	26
Semimanufactures	55	74
Platinum metal, including scrap, waste and ash troy ounces	r 688	1,284
Silver metal, including scrap, waste and ash do	152,362	287,684
Tin:		
Oxide long tons	8	2
Metal, including alloys:		
Unwrought do	r 336	304
Semimanufactures do	r 420	431
Titanium oxide	1,241	1,994
Tungsten, metal and alloys	2	2
Zinc:		
Oxide	606	760
Metal, including alloys:		
Scrap	6	47
Unwrought	2,456	3,332
Semimanufactures	128	507
Other:		
Ores, n.e.s	666	233
Ash and residues containing nonferrous metals	150	115
NONMETALS		
Abrasives:		
Emery	54	50
Grinding and polishing wheels and stones	r 1,184	1,171
Asbestos	r 6,709	11,197
Barite	204	131
Bromine kilograms	62	--
Cement	22,837	54,513
Chalk	356	178
Clays, crude n.e.s.:		
Bentonite	948	1,041
Fire clay	1,021	2,864
Kaolin	675	3,559
Pozzolana and similar earths for cement manufacture	65	100
Other	3,649	149
Diatomite	659	434
Fertilizer materials manufactured:		
Nitrogenous	15,342	17,666
Phosphatic	61,471	42,200
Potassic	3,000	--
Mixed and unspecified	47,941	57,195

See footnotes at end of table.

Table 3.—Iran: Imports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970
NONMETALS—Continued		
Graphite	670	678
Gypsum	354	695
Iodine kilograms	500	(2)
Lime	373	322
Magnesite	37	108
Mica, all forms	13	60
Pigments, mineral:		
Iron (including processed)	489	439
Other	9	129
Precious and semiprecious stones:		
Turquoise grams	12,000	200
Other do	35,597	711,636
Manufactured do	2,090	--
Salt	75	62
Stone, sand and gravel:		
Dimension stone, other	189	15
Stone crushed	474	1,738
Sand and gravel	1,090	256
Quartz	259	718
Sulfur:		
Elemental	545	429
Sulfuric acid	803	154
Talc	333	247
Other, nonmetals n.e.s.:		
Meerschaum, amber, jet	365	25
Oxides and hydroxides:		
Magnesium	216	233
Barium	148	10
Other	1,297	3,526
MINERAL FUELS AND RELATED MATERIALS		
Asphalt, natural	15	150
Coal	7,241	1,551
Peat, including peat briquets	(2)	--
Petroleum refinery products:		
Gasoline, aviation 42-gallon barrels	4	3
Gasoline, motor do	17	20
Kerosine do	9	--
Distillate fuel oil do	1,686	368
Lubricants do	54,075	31,009
Other:		
Bitumen do	42,801	15,327
Other do	14,810	15,626
Total do	113,402	62,348
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	2,328	4,667

[r] Revised.

[1] Data are for Iranian calendar years beginning March 21 of the year indicated.

[2] Less than ½ unit.

COMMODITY REVIEW

METALS

Aluminum.—Iran's first aluminum plant, a 45,000-ton-per-year complex at Araq went on stream in December 1971. The $50 million plant is a joint venture of the Iranian (70 percent) and Pakistani (20 percent) Governments, and the U.S. firm Reynolds International, Inc. (10 percent). Alumina from Australia delivered to Bandar Shahpur is moved to the plant site via the Trans-Iranian Railway and a new spurline. The U.S.S.R. contracted to take 10,000 tons per year of primary metal.

Since 1967 the Geological Survey of Iran has discovered bauxite deposits in various parts of the country. Generally the deposits fall into two categories: diasporic materials and boehmitic materials. These discoveries together with low-cost natural gas as fuel may lead to the domestic production of alumina for the new plant at Araq. One of the most promising discoveries was in the Zagros Mountains west of Isfahan. Surface samples tested 73 percent Al_2O_3. At yearend, core drilling was being conducted to determine the size of the deposit, and the National Iranian Steel Co. was tunneling the south side of the deposit. Another large reserve of bauxitic material suitable as refractory clay was found at Semirom, about 100 miles south of Isfahan. A pilot plant was built during the year to upgrade and to process the clay into refractory brick.

Copper.—Following the withdrawal of Iranian Selection Trust Ltd. (IST) from the Sar Cheshmeh copper development project because of insufficient financial backing, the Government of Iran engaged in numerous talks with a variety of international mining interests in order to select a financial partner and operator for the copper operation. In December, however, the Shah of Iran instructed the Iranian Government to develop the Sar Cheshmeh deposits without foreign participation. Later in the month, after the deposit was formally nationalized, the Minister of Economics announced that an Iranian company would be formed and that plans were to bring the operation into production in 1974 at a capacity of 145,000 tons per year. The Minister added that the Government would handle exports and would, in the long term, seek to build a smelting-refining complex in Iran.

With regard to financing the project, the Government planned to obtain foreign loans to supplement the country's domestic financial resources. In addition, the Minister stated that about 180 expatriate mining experts and technicians would be needed and that it was entirely possible that a form of management contract with a foreign group might be sought.

The Geological Survey of Iran was working jointly with Yugoslav technicians in an area of approximately 24,000 square miles in Kerman Province, and interesting indications of porphyry mineralization have been discovered. At Darreh Zhar, drilling was completed and proven reserves amount to 28 million tons of 0.87 percent copper. Further exploration by tunneling is now underway.

At Qaleh Zari, south of Birjand, a private Iranian company has found a vein deposit of about 2 million tons of 3 to 4 percent copper, mainly chalcopyrite. Japanese interests have formed a joint venture with the Iranian company for mining the ore and constructing a concentrator. The West German company, Metallgesellschaft, A.G. has finished its feasibility study of the Meduk copper deposits, establishing a reserve of about 24,000 tons of ore, 1.14 percent copper. The existence of several low-grade disseminated copper mineralizations have been established from drilling results at Kuh-e Bahr Aseman and Kuh-e Hanza in Kerman Province.

In the northwest, in Azerbaijan, the Geological Survey was drilling copper-molybdenum anomalies discovered by its prospecting groups. In Zanjan and Semnan, some medium and small-sized copper deposits owned by Iranian private companies are under development; production will start in the near future.

Iron Ore.—After almost 2 years of persistent effort, the Japanese firm Marubeni Iida Co., Ltd., was on the verge of concluding a joint venture agreement for the development and exploitation of two iron ore deposits in southern Iran. The Iranian private partner will be Iran Barite Co., which is controlled by Asghar Pairavi (who holds the mineral exploitation concession to both properties). The Government of Iran will hold a 51-percent interest. The deposits, known as Goli Gowar and Tang Zagh, are north of Bandar Abbas. The former deposit, located 30 miles west of Sirjan, is estimated at 250 million tons of a magnetite-hematite ore having about 60 percent iron. The latter deposit indicates a reserve of 100 million tons hematite ore having 50 percent iron.[3] Much of the exploration work at the two properties has already been completed by Japanese teams, and the new company should be able to operate relatively soon after the project has been finalized.

Iron and Steel.—Reportedly, the 600,000-ton-per-year steel plant built by Soviet technicians at Isfahan produced its first pig iron on December 31, 1971. During January 1972, pig iron output averaged 1,800 tons per day. The pig iron was to be stored until mid-1972 when the converter will be ready to process the pig iron into steel. Earlier in the year, the U.S.S.R. and Iran prepared a comprehensive plan of cooperation that covers the next 10 to 15 years. Under the plan, the U.S.S.R. is to assist Iran in constructing the second stage of the Isfahan steel plant, and eventually capacity will increase to about 4 million tons per year.

Expansion of the steel rolling complex at Ahwaz progressed rapidly during the year. When completed the total capacity of the various mills will be 500,000 tons per year. The Iranian Steel Mills Co., mill operated successfully, producing 135,000 tons of light sections and reinforcing bars. The medium section of the mill was completed by Demag, A.G. The initial capacity was to be 100,000 tons per year, but plans were to double the capacity by 1972. Work on facilities of Arya Co., and the Puladsazi Iron Co., was completed during the year, and around 30,000 tons of medium-size beams were produced. With both plants in full operation, the whole complex was expected to produce 400,000 tons in 1972.

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[3] Central Treaty Organization, Economic Committee. EC/20/m/D36. Tehran, Iran. Dec. 5, 1971, p. 6.

During December 1971, the Ahwaz Rolling and Pipe mills was also inaugurated by the Shah. The plant was designated to produce 140,000 tons per year of skelp. In addition, there are two continuous-weld tube mills, one with a capacity of 41,000 tons per year, the other 13,000 tons per year, on a one-shift operation.[4] The mill was expected to be in full production in 1972.

During the year, a group of Japanese interests engaged in talks with Iranian officials on building a $40 million cold-rolled steel sheet mill with a capacity of 500,000 metric tons per year. Subject to government approval, the consortium plans to put the mill in full operation by 1980 and to provide technical assistance, supplies of hot coils, and part of the investment required.[5]

Lead and Zinc.—After increasing for several years because of the new mines, lead-zinc mine output declined because of the lack of markets.

The major lead-zinc mines are: The Kushk mine in central Iran (mainly zinc); Anguran mine in Zanjan area (mainly zinc); Shah Kuh mine in Isfahan area (mainly zinc); Ravanj mine west of Kashan (mainly lead); Zahbad in the Qazvin area (lead and zinc); Duna Nakhlak in Anarak area (lead); Chah-Sorb and Seh-Changi in the Tabas area (lead and zinc). There are many other smaller mines producing mainly lead.

In addition to the foregoing producing mines, extensive exploration and prospecting activities both by the private and public sector were carried out to establish further commercial resources, such as at Amarat near Arak, Kuh-e Sorme near Shiraz, and near Khorram Derreh near Zanjan. A flotation plant, operated on a trial basis, was installed at the latter site.

Manganese.—The National Iranian Steel Co. has contracted to buy in Iran about 20,000 tons per year of 35 percent manganese ore for delivery to its new steel plant at Isfahan. Production was to have increased sharply in 1972.

Uranium.—Following an agreement between the Iranian and French Governments, a group of French and Iranian experts from the Geological Survey of Iran and the French Atomic Energy Commission conducted a widespread, systematic reconnaissance and prospecting for uranium deposits. By the end of 1971, the team had surveyed about 50,000 square miles of the most promising areas. Although no substantial discoveries were made, there were several prospects warranting further investigation.

NONMETALS

Celestite.—A deposit of celestite discovered about 90 miles east of Tehran 3 years ago, is now in production. There are a few other celestite deposits in the prospecting stage in southern Iran near the oilfields. They are believed to contain large reserves of a bedded ore.

Cement.—The Industrial and Mining Development Bank of Iran and private Iranian interests have formed a joint company to erect Iran's third asbestos cement plant. The plant will be located near the Lushan Cement factory in northwestern Iran. The plant's capacity will be 30,000 tons of asbestos cement pipe and 20,000 tons of asbestos cement sheet.

Ocher.—Studies are underway to erect a processing plant on Hormuz Island with a capacity of 5,000 tons per year. Red ocher has been exported from the Island for centuries under the name "Persian Red."

Sulfur.—Native sulfur continues to be produced from bedded and volcanic deposits, but production is small. The greater part is recovered when processing crude oil. Since 1969 Tenneco Oil Co., a U.S. company, has performed extensive field exploration in areas along the Persian Gulf coast. After selecting the most promising blocks in these areas, a core-hole drilling program began in October 1970. Initial work was concluded in April 1971 after drilling 26,283 feet on the three best prospects. No subsurface sulfur mineralization was found, but, exploration will continue.

MINERAL FUELS

Carbon Black.—The National Petrochemical Co., concluded a partnership contract on July 22, 1971, with Cabot Corp., a U.S. firm, for the construction of a carbon black plant at Ahwaz. The 16,000-ton-per-year plant will be completed by mid-1974 and there are plans to double the capacity in the near future. The plant is being financed by Iran's Industrial and Mining Development Bank and the Industrial Finance Corp. of the World Bank.

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[4] Metal Bulletin. No. 5684, Mar. 17, 1972, p. 32.
[5] Metal Bulletin. No. 5593, Apr. 23, 1971, p. 32.

Natural Gas.—The National Iranian Gas Co. (NIGC) on September 18, 1971, signed a protocol with two Japanese companies, Fuji Oil Co. and Marubeni Iida, Inc., covering a joint venture for the long-term export of Iranian liquefied natural gas (LNG) to Japan. Under the agreement, the Japanese partners will finance facilities for the liquefaction and transportation of 4 to 6 million tons of LNG annually (equivalent to 550 to 820 million cubic feet of gas per day) over a 20-year period, with the Iranian company's share of the cost repayable over a 10-year period. The gas is to come from the 1969 natural gas discovery by the Iranian Oil operating companies (Consortium) on Qeshm Island, southwest of Bandar Abbas in the Persian Gulf. The starting date has been set for 1977–78, and the c.i.f. Tokyo price will be $0.75 per million Btu. The cost is expected to be in the vicinity of $800 million for developing the Qeshm field, a liquefaction plant, and five LNG tankers. The venture will be financed by the Japanese partners with the possible assistance of the state owned, Japan Petroleum Development Corp.[6]

Earlier in the year NIGC signed an agreement in principal with C. Itoh and Co., a large Japanese trading company to establish a joint venture in Iran to supply LNG to Japan. According to the June 1971 proposal, the joint venture was to be capitalized at $70 million, which will be shared 50 percent by NIGC, and 25 percent each by C. Itoh and Co. and Entreprise de Recherchés et d'Activites Pétrolièros, the French state entity. It is planned that a pipeline will be consructed to connect the oilfields with Kharg Island where liquefaction facilities will be built to export 3 million tons per year over a 20-year period. At yearend 1971 the plan was pending.[7]

Phase II of the construction of the Iran Gas Truckline (IGAT) was initiated in 1971. It includes increasing the total pumping station capacity of the gathering system to 81,750 horsepower and the capacity of the main transmission line to 457,200 horsepower adding a booster station at Tang-e Pirzal and five more booster stations in the northern section of the line.

Petroleum.—Iran's petroleum production increased 724,496 barrels per day during 1971 in reaching an average of 4,553,153 barrels per day for the year. The increase alone exceeded the 1971 total average daily production of Algeria, the world's 12th largest producer. Production gains resulted primarily from developmental efforts of the Consortium which accounted for 93 percent of the increase. This company was again the major oil producing and refining company in Iran accounting for 92 and 82 percent, respectively, of the country's total crude oil production and refining. Although NIOC is a major refining and marketing firm, its crude oil production accounts for less than 1 percent of the country's total. Companies that have joint ownership of petroleum production with NIOC are Amoco Iran Oil Co. (AMOCO) (formerly Iran Pan-American Oil Co. (IPAC)), Société Irano-Italiènne des Petroles (SIRIP), Lavan Petroleum Co. (LAPCO), Iranian Marine International Oil Co. (IMINOCO), Iran Nippon Petroleum Co. (INPECO), Hormuz Petroleum Co. (HOPECO), and Bushire Petroleum Co. (BUSHCO). Companies that have contractual agreements with NICO are Société Française des Pétroles d'Iran (SOFIRAN), European Group Co. (EGOCO), and Continental Oil Co. of Iran (CONIRAN).

In 1971 the Consortium's capital investment in both refining, production, and field processing (including housing and other amenities) was more than $107 million. Although this is the largest such investment made in a single year, representing a 123-percent increase over 1970, consortium capital expenditures are expected to remain at this level, averaged out over the next decade.

The conventional figure for Iran's crude oil reserves is about 55 billion barrels. However, the consortium and NIOC are concurrently, but independently, using consultants to reassess reserves in the Consortium agreement area. Both companies have agreed to reconcile the findings of their consultants, and it is believed that the new figure will be considerably higher than the current one. Concomitantly, Iran's natural gas reserves are expected to be reevaluated upward. Currently, gas reserves are a conservative 200 billion cubic feet, ranking Iran third in the world (following the U.S.S.R. and the United States). Major fields are NIOC's Khangiran gasfield (in the Sarakhs area of northeast Iran) with 18 trillion cubic feet and the Consortium's Pazanan field with 50 trillion cubic feet.

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[6] Middle East Economic Survey. V. 19, No. 49, Oct. 1, 1971, p. 3.
———. V. 19, No. 50, Oct. 8, 1971, p. 3.

[7] Mining Journal. V. 276, No. 7088, June 25, 1971, p. 522.

The Consortium had nine rigs at work throughout the year, three committed to exploration drilling and six to development drilling. Six exploration and 25 development wells were drilled, of which three of the former and 21 of the latter were producers. Among the joint venture/contract companies, six exploratory and four development wells were drilled. At yearend, five exploration and three development wells were being drilled.

Consortium.—The year 1971 showed an exceptional increase in production thereby setting impressive records.

Net crude oil production averaged 4,170,583 barrels per day, a 19-percent increase compared with that of 1970. The total number of fields connected to the production system was 17, of which three—Paris, Marun, and Karanj—accounted for nearly all of the gain.

A total of 290,000 barrels per day of production capacity was added during the year, bringing the overall production capacity in the Consortium's "Agreement Area" to 4,420,000 barrels per day. The construction of the two-berth sea-island-type loading facility at Kharg Island designed to accommodate tankers up to 500,000 deadweight tons, was proceeding satisfactorily.

The construction of a 42-inch-inside-diameter/48-inch-outside-diameter oil pipeline from Ahwaz to Ganaweh (on the mainland opposite Kharg Island) was nearing completion at yearend.

One additional 1-million-barrel crude oil storage tank was under construction on Kharg Island, increasing the nominal storage capacity there to 14 million barrels.

Crude oil processed in the consortium's Abadan refinery, one of the world's largest, averaged 422,347 barrels per day, which was the highest output attained since the Consortium was formed in 1954. The following tabulation shows products produced in 1970 and 1971, in volume-percent. Note the significant rise in motor gasoline and kerosine output:

	1970	1971
Aviation gasoline	4.2	3.4
Motor gasoline	9.0	12.2
Jet fuel	8.4	7.3
Kerosine	9.6	11.6
Distillate fuel oil	17.5	18.1
Residual fuel oil	44.1	44.5
Other	7.2	2.8
Total	100.0	100.0

The very significant increase in crude oil production and exports, coupled with the agreements signed in November 1970 and February 1971 led to a substantial increase in revenues paid by the Consortium's members to the Government of Iran. Total payments for 1971, including taxes and royalties amounted to $1.79 billion, up from $1.05 billion [8] in 1970.

NIOC.—During 1971 NIOC revealed its program of capital expenditure for 1970–75. The program called for expenditure of $848 million of which $177.8 million was projected for 1970, $263.3 million for 1971, and $151.0 million for 1972. The most important elements included the following: (1) The second Ahwaz-Rey-Tehran crude oil pipeline, which will have a capacity of 410,000 barrels per day from Ahwaz to Rey (near Tehran) and 265,000 barrels per day from Rey to Tehran. A contract for this line has been let; (2) increasing the capacity of the present Ahwaz-Tehran crude oil line from 94,000 to 116,000 barrels per day. A contract was let to install five new pump stations and replace three of the old pump stations; (3) construction of a products pipeline with an initial capacity of 17,500 barrels per day from Rey to Tabriz. As with the Rey-Mashad line, this pipeline will be used first for products, and when the refineries at Tabriz and Mashad are constructed, these lines will be expanded and converted to crude oil; (4) expansion of the existing Rey-Shahrud-Mashad line to 25,090 barrels per day from Rey to Shahrud and 18,000 barrels per day from Shahrud to Mashad; (5) construction of the 40,000-barrel-per-day Shiraz refinery, which was begun in 1970 and is scheduled for completion in 1973; and (6) expansion and renovation of the Kermanshah refinery from 8,000 to 15,000 barrels per day, which was completed in November 1971.

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[8] Converted from United Kingdom pounds (UK£) to U.S. dollars at the rate of UK£ 1 = US$2.40.

There was no progress during 1971 on the projected Ahwaz to Iskenderun crude oil pipeline. Potential offtakers of the crude oil have not pledged sufficient commitments, of which a minimum of 900,000 barrels per day is necessary, for lending institutions to provide the required financial support.

Iran's first venture in foreign oil exploration was announced in August 1971. NIOC in a joint venture with British Petroleum Co. Ltd., presented an application for oil exploration acreage in the United Kingdom sector of the North Sea. In May the Sasolburg refinery in the Republic of South Africa was dedicated. With 17.5-percent ownership, this is the first foreign refinery in which NIOC has an interest. NIOC will provide 70 percent of the crude oil supply to this 55,000-barrel-per-day plant.

In May 1971 NIOC signed an $11 million contract with the Yugoslav firm Ingra for the construction of a topping plant on Lavan Island in the Persian Gulf where export terminals for two offshore companies, LAPCO and IMINOCO, are situated. The 24,000-barrel-per-day plant is expected to be completed in 1974 producing mainly fuel oil for bunker fuel and kerosine. NIOC will pay for the refinery by bartering its share of crude oil from Sassan and Cyrus fields.

The Tehran refinery of NIOC was thoroughly overhauled in 1971 after 2 years of continuous operations. After completion of the overhaul work, the major units were tested for short-term performance evaluation. The crude distillation unit tested 112,500 barrels per stream-day, 31 percent above designed capacity. Other units also tested at rates above designed capacity. During the last quarter of 1971 the refinery was operated at a rate of 100,000 barrels per day. At yearend 1971, plans were being finalized for doubling the capacity of the refinery, including a new lube plant, propane deasphalting, a furfural unit, dewaxing, and a hydrofining plant.

AMOCO.—The maximum producing capacity of IPAC's two producing fields was set in 1971 at 110,000 barrels per day of 34° API crude oil from Darius and 35,000 barrels per day of 18°–19° API crude from Cyrus. Development plans are being formulated for the recently discovered Ardeshir field about 40 miles northwest of Kharg Island, which was designated "commercial."

Although the exploration period of the original concession terminated in 1971, IPAC was still evaluating its Esfandiar and Fereidoon fields, which straddle Iran's Persian Gulf median line boundary, and was to have begun engineering work in 1972.

SIRIP.—At the northern end of the Persian Gulf SIRIP brought its offshore Nowruz oilfield onstream in April 1971, and together with further development of the Hendijan field, raised average production for the year to 57,000 barrels per day, up 75 percent from 1970 production. Development of the Hendijan field has been completed; maximum capacity is about 44,000 barrels per day of 30°–30° API gravity crude oil with a sulfur content below 1 percent. At yearend 1971 production was averaging 88,000 barrels per day, and projected 1972 was 95,000 barrels per day. Both Nowruz and the older Behregansar and Hendijan oilfields are linked by pipeline to the onshore Imam Hassan collection center. A short underwater line transports the oil from Imam Hassan to a single point loading buoy several miles offshore that is capable of handling 250,000-deadweight-ton tankers.

Onshore, operations are continuing in the Zagros Mountains where a number of finds are being evaluated. The Kuh-e Rig discovery where eight wells have been drilled and flow rates up to 3,000 barrels per day on pumps have been registered is regarded potentially commercial. In addition, two rigs are currently drilling the third and fourth wells of a five-well test program at Shorum. Two wells, drilled at Dudrou and Haft Chesmeh, proved disappointing.

LAPCO.—It was announced that a new appraisal well would be drilled near the 1967 discovery on the "W" structure, hopefully leading to a development program that would bring the structure into production in 1972. The "W" structure is located about 50 miles southwest of Lavan Island near the boundary line with Qatar. Two wells have been completed as producers, the first testing 5,426 barrels of light (41.6° API gravity) crude oil.

On December 2, a completed development well blew out of control. After several weeks of pouring 10,000 barrels per day of oil onto the Persian Gulf, it was brought under control.

IMINOCO.—Development of the offshore Rostam field was completed at yearend, and production from 26 wells, some of which are on pump, averaged about 35,000 barrels per day of 38° API gravity crude oil. Production at yearend from Rakhsh, 17 miles northeast of Rostam, was running about 38,000 barrels per day of 34° API gravity crude. Five wells were in production and with the six wells that were to be drilled in 1972, output was to have been 70,000 barrels per day.

IMINOCO continued exploratory drilling with one well, targeted at approximately 7,500 feet in progress 15 miles from Rostam on the "R" Block. An additional three wells were scheduled for 1972, one on the Alpha-1 structure, one on the "O" structure, where two previous dry wells were drilled, and one deep test wildcat on the Rostam field to the Khuff formation at approximately 12,000 feet.

INPECO.—On November 8, 1971, a joint venture of Japanese interests (33.33 percent) Mobil Oil Corp. (16.67 percent) and NIOC (50 percent) signed an agreement covering a new concession in Lurestan. The terms called for a $40 million signature bonus, and a commitment to spend $5 million during a 9-year exploration period. This is the first crude oil exploration concession secured by the Japanese and the first in the Persian Gulf areas to be operated jointly by Japanese and United States interests. The concession agreement covers an onshore area of nearly 3,100 square miles formerly held by the Consortium. Also involved is the construction of a jointly owned refinery in the event commercial production is attained.

The royalty payment will be 12.5 percent of posted prices with sliding-scale royalties rising to 16 percent of the posted price depending on amounts produced.

SOFIRAN.—SOFIRAN has relinquished the entire onshore acreage included in the 1966 service contract with NIOC after completing a seismic survey and drilling three exploration wells. Offshore, the company has relinquished 50 percent of the 7,720-square-mile tract where nine exploration wells have been drilled. SOFIRAN's only potential commercial discovery has been off Sirri Island in the lower Persian Gulf area near the median line boundary with Abu Dhabi, where two exploration wells proved a large potential reserve but a third well confirmed an especially tight formation. SOFIRAN is not considering commercial production but has not abandoned hope that future technical developments may make production feasible.

EGOGO.—The West European consortium, which consist of the State oil entities of France, Italy, Spain, and Austria, and the Belgium firm, Petrofina, S.A., drilled its first well on its Kagan permit on the Namak structure near the Persian Gulf. It was planned to drill to about 10,000 feet. This was the first of a 15-month drilling program that will include one well each on the Aghar and Sim structures on acreage south of Shiraz.

HOPECO.—HOPECO, which is owned equally by Mobil Oil Corp. and NIOC, was the successful bidder on a 1,350-square-mile concession in the Straits of Hormuz at the mouth of the Persian Gulf. Mobil paid a $2 million signature bonus for a 6-year exploration concession in which it must spend $11 million. Similar to the other new concession agreements signed in 1971, the royalty payments (which are expensed) are 12.5 percent with a sliding scale up to 16 percent, depending on production levels.

BUSHCO.—Amerada Hess Corp. in a jointly owned venture with NIOC obtained a 1,200-square-mile offshore Persian Gulf concession on July 27, 1971. The block lies just south of the IPAC concession and extends to the Persian Gulf median line. Bonuses include $5 million at signature and $6 million at varying production levels. The royalty is 12.5 percent fully expensed, ranging up to 16 percent when accumulative production reaches 75 million barrels.

CONOCO.—This company completed preliminary exploration work on the 4,965 square mile onshore service contract area north of Bandar Abbas. Drilling of its first exploration well began in October 1971 at a site in the Kuh-e Finu; the goal was to reach 11,000 to 12,000 feet. A second well was scheduled for Kuh-e Namak in 1972.

Petrochemicals.—On October 19, 1971, Iran's National Petrochemical Co. (NPC), a subsidiary of NIOC, signed an agreement with Mitsui and Co., a Japanese firm, to build a $358 million petrochemical complex near the already operating complex at Bandar Shahpur. The new facility will use naphtha from the Abadan refinery and natural gas from the oilfields. The plant will have an annual capacity to produce 300,000 tons of ethylene, 200,000 tons of other olefins, 450,000 tons of aromatics, and 250,000 tons of caustic soda. Principal end-products will be polyethylene, ethylene dichloride, and ethyl benzine. The new complex is expected to start production in 1976.

Early in the year, the Government announced that it would prohibit the importation of chemical fertilizers during the remainder of 1971 in order to provide full protection for the Shahpur Chemical Co. plant completed in November 1970. In 1970 Iran imported 160,000 tons of fertilizer and consumed 230,000 tons, the difference being supplied by the Shiraz plant of Iran Fertilizer Co. With the increase in production from the first Shahpur plant, domestic production is expected to meet sharply growing local demand, estimated as 500,000 tons per year.

The Mineral Industry of Iraq

By David A. Carleton[1]

The petroleum industry, long the mainstay of the Iraqi industrial economy, was the center of significant developments and the topic of numerous protocols with Soviet-bloc nations. Other major mineral developments included the near-fruition of a Frasch sulfur operation, expansion of a cement plant, and completion of a petrochemical plant. Little is known of the gypsum, lime, and salt producing facilities and equipment in Iraq.

In 1971 crude oil production averaged 1,710,444 barrels per day, an increase of 9.2 percent over that of 1970. However, since total Middle East crude oil production increased 17.4 percent in 1971, Iraq's share of Middle East crude oil production continued to decline, accounting for only 10.4 percent of the 1971 Middle East production, compared with 11.1 percent in 1970 and 18.4 percent in 1960. Crude oil proved reserves of 36 billion barrels at the end of 1971 equaled 5.8 percent of the world total. At the 1971 production rate, proved reserves in Iraq were sufficient for 58 years.

Crude oil produced in 1971 was valued at an equivalent of $1.2 billion based on estimated f.o.b. prices and was 33 percent more than that in 1970. The output of crude oil contributed an estimated 33 percent to the country's gross national product (GNP) in 1971 compared with 38 percent in 1960. During the year, the Government of Iraq received $989.3 million in oil payments which represented about 95 percent of the country's foreign exchange earnings and 69 percent of government revenues. Because of accords reached between the Government and officials of the Iraq Petroleum Companies (IPC group), average payments increased from $0.95 per barrel produced in 1970 to $1.59 per barrel in 1971. The average per-barrel payments varied considerably depending on point of export. Payments for production piped through Syria and shipped from Mediterranean ports averaged $1.76 per barrel. Oil exported from the Persian Gulf port of Khor al-Amaya averaged $1.30 per barrel. The IPC group is composed of Iraq Petroleum Co., Ltd. (IPC); Mosul Petroleum Co., Ltd. (MPC); and Basrah Petroleum Co., Ltd. (BPC).

In early 1971, as a result of the Organization of Petroleum Exporting Countries (OPEC) settlement in Tehran, the posted (or tax reference) prices were raised $0.435 per barrel for crude oil loaded at Khor al-Amaya. Later in the year the Government reached another agreement with the IPC group to raise the posted prices of crude exported from Baniyas, Syria and from Tripoli, Lebanon, by $0.801 per barrel. The Government also received from the IPC group a $20.2 million payment and a 4-year interest-free $10 million loan. Although relationships between the Government and the IPC group were improved over previous years, the situation deteriorated by yearend. A new round of negotiations was planned for early 1972. Included were disputed production levels from northern fields, back payments for royalty expensing, transfer of group headquarters from London to Baghdad, and a government claim for 20-percent equity participation in the IPC group.

The Government company Iraq National Oil Co. (INOC), with substantial aid from East European countries, was preparing to bring its North Rumaila oilfield into production. At the end of 1971 the Government approved $1.5 billion for an expanded oil development program to create a public oil sector capable of raising production by 10 percent annually.

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[1] Petroleum specialist, Division of Fossil Fuels.

PRODUCTION

Crude oil production in 1971 totaled 624.3 million barrels including an estimated 2.6 million barrels from the small government-owned Naft Khaneh oilfield. Marketed natural gas production rose 11 percent as the principal consumer, the Government's sulfur recovery plant in the Kirkuk area, came into full operation without serious operating problems. Near the close of 1971 natural gas production was averaging about 40 million cubic feet per day.

Other than statistics published by oil companies, data on the output of other mineral commodities are not current. The latest data available lists cement production in 1968 at 1,399,924 tons of which 200,374 tons was classified as salt resistant. Similarly, lime production increased 7.5 percent to a total of 364,237 tons in 1968.

Table 1.—Iraq: Production of mineral commodities

Commodity [1]	1969	1970	1971 [p]
Cement ______ thousand metric tons	1,381	[e] 1,400	[e] 1,400
Gas, natural:			
Gross production [e] ______ million cubic feet	196,000	200,000	220,000
Marketed production ______ do	31,617	27,720	30,722
Petroleum:			
Crude [2] ______ thousand 42-gallon barrels	557,093	571,840	624,312
Refinery products:			
Gasoline ______ do	3,272	3,239	3,636
Jet fuel ______ do	651	608	972
Kerosine ______ do	4,174	4,480	4,687
Distillate fuel oil ______ do	5,701	5,737	5,775
Residual fuel oil ______ do	9,669	9,790	10,749
Lubricants ______ do	246	329	757
Other ______ do	855	1,062	767
Refinery fuel and losses ______ do	[e] 1,236	[e] 1,515	[e] 1,969
Total ______ do	[e] 25,804	[e] 26,760	[e] 29,262
Salt ______ thousand metric tons	50	46	[e] 60

[e] Estimate. [p] Preliminary.

[1] In addition to the commodities listed, "juss," an impure sandy gypsum, lime, and a variety of crude construction materials (clays, stone, sand and gravel) are produced, but available information is inadequate to make reliable estimates of output levels.

[2] Includes an estimate for production from the Government-owned Naft Khaneh field.

TRADE

Crude oil exports account for virtually all of the value of mineral exports. In 1971 exports of crude oil piped to Syria and Mediterranean ports were valued at $646.3 million, and those shipped via the Persian Gulf were valued at $289.5 million. West European countries were the destination for 98 percent of Iraq's crude oil exports from Mediterranean ports and 59 percent of those from the Persian Gulf. African and South American countries received 22 percent of Iraq's Persian Gulf total crude oil exports, whereas Australia and North America received most of the remainder. Cement exported to Persian Gulf riparian countries is the only significant nonpetroleum mineral export. Iraq's major mineral imports are iron and steel commodities, including semimanufactures from the U.S.S.R., several West European countries, and India.

Table 2.—Iraq: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum metal and alloys, waste and scrap	25	--
Copper metal and alloys, all forms	1,525	1,200
Iron and steel:		
Waste and scrap	11,995	24,359
Semimanufactures	4	53
Lead metal and alloys, waste and scrap	775	--
Magnesium and beryllium	--	70
Silver metal partly worked but not rolled kilograms	--	1
Zinc metal and alloys, unwrought	--	100
NONMETALS		
Cement	294,662	335,638
Clay products, refractory and nonrefractory	[r] 218	199
Diamonds (other than industrial), not set or strung thousand carats	--	295
Gypsum and plasters	295	3,481
Stone, sand and gravel:		
Dimension stone:		
Crude	500	318
Worked	--	9
Gravel and crushed rock	10,070	37,542
Sand excluding metal bearing	50	74
MINERAL FUELS AND RELATED MATERIALS		
Petroleum:		
Crude and partly refined thousand 42-gallon barrels	[r] 519,677	537,761
Refinery products:		
Gasoline do	(1)	(2)
Kerosine do	[r] (2)	--
Distillate fuel oil do	[r] 809	563
Lubricants do	(1)	54
Naphtha do	[r] 94	64
Bitumen do	[r] 400	228
Other do	[r] 3	6
Total do	[r] 1,306	915

[r] Revised.
[1] Revised to none.
[2] Less than ½ unit.

Source: Central Statistical Organization, Ministry of Planning, Republic of Iraq, Baghdad. Foreign Trade Statistics. 1969 and 1970, 816 pp.

Table 3.—Iraq: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum:		
Oxide and hydroxide	--	3
Metal including alloys, all forms	[r] 3,063	3,424
Arsenic trioxide	13	7
Chromium oxide and hydroxide	--	14
Copper metal including alloys, all forms	[r] 1,899	1,310
Iron and steel:		
Pig iron, cast iron, spiegeleisen	807	--
Sponge, shot, grit, iron pellets	7	369
Steel:		
Ingots	--	966
Blooms, billets, slabs, sheet, bars	--	25
Tubes and pipe blanks	8,306	22,564
Semimanufactures:		
Wire rods	133,369	7,841
Other bars and rods		136,822
Angles, shapes, sections		76,851
Universals, plates, sheets	41,618	55,804
Hoop and strip	526	720
Rails and accessories	3,875	91
Wire	6,442	7,574
Tubes, pipes, fittings	23,103	25,826
Lead metal including alloys, all forms	80	167
Magnesium and beryllium	[1] 4	119
Mercury 76-pound flasks	--	67
Nickel metal including alloys, all forms	[r] 4	8
Platinum-group metals partly worked or unworked troy ounces	--	289
Tin metal including alloys, all forms long tons	178	195
Titanium oxides	--	303

See footnotes at end of table.

Table 3.—Iraq: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS—Continued		
Zinc:		
Oxide and peroxide	182	17
Metal including alloys, all forms	r 162	124
Other:		
Ore and concentrate of nonferrous base metals n.e.s	[2] 8,576	81
Oxides, hydroxides, and peroxides of metals n.e.s	543	114
Metals, metalloids	--	26
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice stone, emery, natural corundum, and other	5	9
Grinding and polishing wheels and stones	268	242
Asbestos	2,772	2,000
Barite and witherite	111	154
Cement	14,945	22,935
Chalk	(3)	673
Clays and products (including all refractory brick):		
Crude n.e.s	3,894	4,666
Products:		
Refractory (including nonclay bricks)	2,338	3,145
Nonrefractory	3,083	4,271
Diamond:		
Gem not set or strung carats	--	140,000
Industrial do	--	10,000
Fertilizer materials:		
Crude:		
Nitrogenous	--	94
Manufactured:		
Nitrogenous	50,901	45,504
Phosphatic	--	7,005
Other including mixed	90	1
Ammonia	195	253
Graphite, natural	--	4
Gypsum and plasters	28	176
Lime	295	50
Mica	23	29
Pigments, mineral:		
Natural, crude	(3)	819
Iron oxides, processed	NA	60
Salt	439	407
Sodium and potassium compounds n.e.s.:		
Caustic soda	10,653	3,007
Caustic potash, sodic and potassic peroxides	618	63
Stone, sand and gravel:		
Dimension stone crude and partly worked	4,169	1,992
Gravel and crushed rock	401	10
Limestone	282	60
Quartz and quartzite	20	--
Sand excluding metal bearing	132	74
Sulfur:		
Elemental:		
Other than colloidal	3	610
Colloidal	318	51
Sulfur dioxide	--	1
Sulfuric acid	155	41
Talc, steatite, natural	609	592
Other:		
Bromine, iodine, chlorine, fluorine	338	(4)
Oxides, hydroxides, and peroxides of barium, strontium, and magnesium	4	24
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	13	35
Carbon black	34	98
Coal and briquets	95	348
Coke and semicoke	993	56
Hydrogen and rare gases	1	6
Peat including peat briquets and litter	--	2
Petroleum refinery products:		
Gasoline thousand 42-gallon barrels	r 8	10
Lubricants do	r 27	3
Jelly and wax do	3	1
Other:		
Nonlubricating oils n.e.s do	(4)	2
Bitumen and other residues do	(4)	1
Bituminous mixtures n.e.s do	2	1
Mineral tar and other coal–, petroleum–, or gas–derived crude chemicals	11	7

r Revised. NA Not available.

[1] Excludes beryllium.

[2] May include iron ore and roasted pyrites.

[3] In 1969, chalk and earth colors were reported as one category, 1,427 tons.

[4] Less than ½ unit.

Source: Central Statistical Organization, Ministry of Planning, Republic of Iraq, Baghdad. Foreign Trade Statistics. 1969 and 1970, 816 pp.

COMMODITY REVIEW

METALS

Iron Ore.—Sedimentary iron ores were discovered in Wadi Husainiya by a group of Iraqi and Soviet geologists in 1964. The results of investigations that followed were published in 1971.[2] The findings revealed that the ore is in the form of goethite and turgite at the contact of the Upper Triassic and Lower Jurassic carbonate formations. Furthermore, it was found that the commercial value of the iron deposits was limited by the variable composition, the small amount of ore, and the extremely difficult accessibility of the area which is 20 miles east of Rutba in Iraq's western desert.

NONMETALS

Cement.—Construction of the Samawah cement plant which began in 1969 continued with the assistance of a Kuwaiti credit equivalent to about $14.6 million. The complete expansion project, including ancillary facilities, is expected to be completed in 1973 at a total cost of $23.3 million. The expanded plant will have an annual capacity to produce 900,000 tons of cement.

Fertilizer Materials.—The chemical fertilizer plant at Abu al-Khusaib, near Basrah, was completed in April 1971. It has an annual capacity of 56,000 tons of urea, 140,000 tons of ammonium sulfate, 66,000 tons of ammonia, and 110,000 tons of sulfuric acid. The plant utilizes natural gas supplied from the nearby Rumaila oilfield through a 35-mile pipeline. Prior to completion, Iraqi officials signed an agreement to deliver 50,000 tons of urea to the Arab Republic of Egypt in early 1972. When the plant was officially inaugurated in July, an agreement for the export of 25,000 tons of fertilizers to the People's Republic of China had already been concluded and India had expressed an interest in the purchase of 300,000 tons of ammonium sulfate and 100,000 tons of urea. The cornerstone of this natural-gas-based nitrogenous fertilizer plant was laid in April 1966.

The Iraqi Government is reported to be interested in constructing a fertilizer complex at Anah on the Euphrates River about 70 miles east of the Syrian border. Phosphate fertilizers would be produced from indigenous raw materials; that is, sulfur from Mishraq and phosphate rock from the Wadi Akash deposits located about 70 miles from the proposed site. The latter deposits were discovered by a team of Soviet and Iraqi geologists in 1970.

Sulfur.—At the end of 1971, Iraqi officials were preparing to inaugurate the Mishraq sulfur project, which has been slow to come to fruition. During the year, Iraqi officials arranged contracts with the Syrian Government covering the export of sulfur from the Syrian ports of Tartus and Latakia amounting to 100,000 tons in 1972. At yearend 1971, an agreement was reached between Iraq and Syria to establish a new rail link connecting the two countries via the border villages of Bu Kamal (Iraq) and Dair al-Zur (Syria) to facilitate the transport of sulfur to Tartus.

The bulk of Mishraq sulfur will be delivered by rail to the Persian Gulf port of Umm Qasr. An agreement was reached at the close of 1971 with the People's Republic of China for the purchase of a minimum of 100,000 tons of Iraqi sulfur per year for the next 5 years. Trial production from the Mishraq deposit began in December 1971 from 15 borings using the Frasch method. This represented the first stage of the project, which calls for a capacity of 250,000 tons per year by 1972. A second stage, envisaged for 1974, will increase production to 1 million tons annually. In August, Iraq offered to supply India with 250,000 tons of sulfur annually for 2 years and 500,000 tons annually during subsequent years. India was offered the option to pay for the sulfur through exports of industrial machinery and other products or with foreign exchange.

MINERAL FUELS

Natural Gas.—A team from the Swiss subsidiary of the U.S. firm Chemical Construction Corp. (Chemico) began survey work in connection with a projected natural gas liquefaction plant in south Iraq. Chemico technicians visited BPC oilfields to inspect degassing facilities and have surveyed potential sites for the plant intended to process North Rumaila associated gas.

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[2] Economic Geology. V. 66, No. 7, November 1971, pp. 995–1004.

INOC estimates that 35 million cubic feet per day of natural gas is available from BPC fields and that an additional 62.5 million cubic feet per day will become available when the North Rumaila field goes into production.

Discussions also continued on the project to supply Iraq natural gas to Turkey; however, no conclusions were announced.

Petroleum.—The Iraqi Government approved an allocation equivalent to $1.5 billion for an expanded 10-year program to develop the nation's oil industry. The overall objective is to increase crude oil production by a minimum of 10 percent annually while switching by 1975 from government financing funds to those generated by INOC. Major targets are to diversify supply by producing other crude oils of differing gravities from known reservoirs and thereby improve the marketability of Iraqi oils. In addition increase reserves, improve drilling, producing, and transportation techniques, expand export capabilities, construct a large-diameter pipeline from southern Iraq to the Mediterranean Sea via Syria, establish a tanker fleet, and develop plans to exploit natural gas.

The Iraqi-Romanian agreement for economic and technical cooperation was signed in October and was ratified into law in December. The agreement provides for a $98 million low-interest loan whereby Romanian establishments will undertake geophysical surveys and drilling operations and provide equipment including refining facilities. It also provides for mutual cooperation in the establishment of joint refineries in Iraq, Romania, or other countries.

During August the Iraqi Government ratified that portion of the economic and technical protocol with the U.S.S.R. which stipulates that Soviet organizations will carry out projects necessary to increasing North Rumaila crude oil production capacity from 100,000 barrels per day to 360,000 barrels per day. Actual drilling of the 20 new wells was scheduled to begin during the first quarter of 1972 directly after the first stage of development is completed and is planned for completion in 1974. The Soviet organization, Technoexport, will direct the work.

A joint Iraqi-Soviet team completed a year-long survey of the oil and gas potential of the northern and central areas of Iraq. Although a complete report was prepared, the results were not published. A similar survey is planned for southern Iraq. At yearend INOC decided to form a third seismic survey team to explore during 1972 an area near al-Rifa'i which lies northwest of Basrah. The other two seismic teams were engaged in exploring the al-Ahwar area, also near Basrah, and the Ratawi and Luhais areas.

In early 1971, a subsidiary of the French Government agency, Enterprise de Recherches et d'Activités Pétrolières, called Elf-ERAP, relinquished 65 percent (7,000 square kilometers) of its 10,800-square-kilometer contract agreement area. This left Elf-ERAP with only two areas, one near Basrah and the other at Buzurgan near the Iranian border. Elf-ERAP finished drilling two more wells at Buzurgan, making a total of four wells in the field. The last of these, Buzurgan No. 4, reportedly tested 10,000 barrels per day, and at yearend the company was appraising the structure. In addition Elf-ERAP had a discovery at Abu Ghirab, a few miles north of Buzurgan. A second well at Abu Ghirab was completed and at yearend was under test. Including the Siba oilfield found in 1969, Elf-ERAP has found three fields for INOC. However, pending conclusion of a serious dispute between Elf-ERAP and INOC over contract terms, no plans on production have been decided.

A long-term contract for the supply of Iraqi crude oil to Brazil was signed in December between INOC and the Brazilian state oil agency, Petróleo Brazileiro, S.A. (Petrobrás). Reportedly, a little over 2 million tons (about 15 million barrels) of Iraqi crude oil is to be delivered to Brazil over a 5-year period starting in 1972. Iraq will endeavor to purchase Brazilian products and services up to a value of $5 million f.o.b. Brazil.

Snam Progetti S.p.A., a subsidiary of the Italian State oil agency, Ente Nazionale Idrocarburi, began survey work in connection with its contract with the Iraqi Government to provide engineering and consulting services for the projected large-diameter, 777-mile pipeline from North Rumaila oilfield in southern Iraq to Tartus on Syria's Mediterranean coast. By yearend, a study covering the Iraqi portion had been completed and permission for the team to enter Syria was expected to be granted in the near future.

Near the close of 1971 the Hungarian agency Chemocomplex began to drill the first of three wells it contracted for on an extension of the Jambar oilfield now being produced by IPC. Earlier, Chemocomplex completed the last of four wells in the North Rumaila oilfield for INOC. The first development well in the Nahr Umr oilfield was spudded by INOC during November 1971. Production at Nahr Umr, which is 18 miles east of North Rumaila oilfield, is scheduled to begin in 1974 at about 10,000 barrels per day with ultimate production reaching 40,000 barrels per day.

INOC made its first delivery of "royalty" crude oil to a foreign country in 1971. The oil was obtained by Iraq from IPC under its option to take all or part of its 12.5-percent royalty in cash or kind. It was shipped by INOC from the IPC terminal at Tripoli, Lebanon, in three separate shipments totaling 70,000 tons (about 530,000 barrels). Reportedly, the crude was destined for Greece.

A team of Soviet technicians with the organization Neftekhimpromexport spent 3 months in Iraq preparing a feasibility study on the projected Baghdad-Basrah refined products pipeline. The project is covered by the Iraq-Soviet protocol for technical and economic cooperation signed in April 1971.

The first of eight 126,000-barrel storage tanks at the Fao terminal at the mouth of the Shatt al Arab was completed. In 1970 BPC relinquished four Fao terminal piers to the Iraqi Port Administration. In addition the Czechoslovakian organization Technoexport is continuing with construction of a 70,000-barrel-per-day, $62 million refinery near Basrah scheduled for completion in August 1972. Construction of a loading pier on the Shatt al Arab to serve the refinery began in late 1971. Initially, the pier will handle 20,000-deadweight-ton tankers with provisions for modification to eventually accept 30,000-deadweight-ton tankers.

Iraq's first tanker, a 35,000-deadweight-ton vessel named *Rumaila,* was launched in Spain. This is one of seven 35,000-deadweight-ton-tankers to be built in Spain for the Iraq Maritime Transport Co. under the terms of a $70 million loan which will be repaid in crude oil produced by INOC.

On December 21, 1971, INOC signed a contract with U.S.S.R. officials to charter Soviet tankers, effective during the first quarter of 1972. Presumably, these tankers will fill the gap until Iraq's own fleet of seven 35,000-deadweight-ton-tankers are built. The tankers will handle exports of Rumaila crude oil which are expected to reach 100,000 barrels per day.

In December 1971, 37 INOC trainees were undergoing training in petroleum engineering, geophysics, and geology in foreign universities in the United Kingdom, the Netherlands, the U.S.S.R., Hungary, Algeria, and the United States. In addition, 77 INOC trainees were receiving instruction in drilling and instrumentation within Iraq.

Table 4.—Summary of the Iraq, Mosul, and Basrah Petroleum Companies, 1970 and 1971

	1970	1971
Crude oil production, by field:		
Kirkuk……thousand 42-gallon barrels	407,721	364,560
Rumaila……do	100,046	190,636
Zubair……do	28,162	34,917
Bai Hassan……do	20,386	20,112
Ain Zalah……do	7,589	7,211
Jambur……do	3,366	2,263
Butmah……do	1,833	2,013
Total……do	569,103	621,712
Daily average……42-gallon barrels per day	1,559,186	1,703,321
Crude oil exports:		
Europe……million 42-gallon barrels	424.0	479.4
Middle East……do	41.8	14.4
Western Hemisphere……do	31.9	38.2
Africa……do	23.2	29.3
Far East and Australasia……do	11.8	27.8
Unaccounted for……do	7.7	4.2
Total……do	540.4	593.3
Via Syrian border [1]……do	414.2	366.4
Via Persian Gulf [1]……do	127.8	222.7

See footnotes at end of table.

Table 4.—Summary of the Iraq, Mosul, and Basrah Petroleum Companies, 1970 and 1971—Continued

	1970	1971
Shipments to—		
Iraqi refineries million 42-gallon barrels	24.2	25.2
Syrian and Lebanese refineries do	18.2	14.4
Export terminals:		
Banias, Syria do	226.0	208.0
Tripoli, Lebanon do	170.0	144.8
Khor al-Amaya, Iraq do	127.8	222.7
Total export terminals do	523.8	575.5
Marketed natural gas:		
Petroleum companies million cubic feet	22,736	20,365
Iraqi Government do	4,984	10,357
Total do	27,720	30,722
Percent of total production [e]	14	14
Footage drilled	17,912	11,213
Number of wells, at yearend:		
Oil	106	[2] 122
Gas	1	1
Shut-in	44	30
Abandoned and observation	323	325
Water injection	14	14
Total	488	492
Water injected million 42-gallon barrels	485.0	429.4
Payments to the Iraqi Government:		
IPC million US$	401.3	681.6
MPC do	8.6	15.1
BPC do	102.7	292.6
Total do	512.6	989.3
Payments to Governments of Syria and Lebanon do	63.8	75.6

[e] Estimated.
[1] As reported.
[2] Yearly average.

Source: Review for 1970 and 1971, Iraq, Basrah, and Mosul Petroleum Companies.

The Mineral Industry of Ireland

By J. M. West[1]

Among the important events in the Irish minerals industry during 1971 were the discovery of natural gas in offshore exploration drilling and confirming large reserves at the zinc-lead discovery of Tara Exploration and Development Co., Ltd., potentially worth nearly $2 billion[2] in the ground. Generally, Ireland's metal mining industry produced at lower rates in 1971 owing to the depressed economic activity of its prime consumer, the United Kingdom. Conversely, the nonmetals producing industry showed greater activity than in 1970 when operations were curtailed because of strikes, and cement output was considerably higher in 1971. Imports of crude oil and consumption of petroleum products were sharply higher in 1971 as a result of industrial demands. Petroleum refining continued to rise. Consideration was given to establishing an alumina plant to treat imported bauxite. A plant to treat manganese dioxide for batteries was in the planning stage, pending approval of plans for construction of a lead-zinc smelter.

Underlying problems in the Irish economy continued to be inflation, economic stagnation, and unemployment. Growth in the real gross national product (GNP) was estimated at about 3 percent in 1971, a little higher than in 1970. The 1971 GNP amounted to $4.8 billion at current prices, or $3.7 billion at constant 1968 prices. The country's trade deficit, partly due to oil imports, rose slightly during 1971 to a yearend figure of about $0.56 billion. The prospects of Ireland's entry into the European Communities in 1972–73 appeared favorable, and such entry was expected to have a marked stimulus on Irish economic growth, including anticipated growth in the minerals producing and consuming industries. Ireland continued to offer generous grants to finance new plants and equipment through its Industrial Development Authority. Also, the Government allowed a 15-year tax holiday on all profits derived from exports as an incentive for establishing mineral processing and other industrial plants. Ireland's labor costs, although rising, continued to be comparatively low for a relatively developed country.

PRODUCTION

Lead, zinc, and silver production declined in 1971, but outputs of most other mineral products were higher. Copper and mercury production rose despite declining world prices. Mercury was produced as a byproduct at the Gortdrum copper mine. Output of construction materials rose in accordance with higher levels of construction activities. Output of refined petroleum products were greater than in 1970.

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[1] Physical scientist, Division of Nonferrous Metals.

[2] Where necessary values have been converted from the Irish pound to U.S. dollars at the rate of £1=US$2.55.

Table 1.—Ireland: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1969	1970	1971 [p]
METALS			
Copper, mine output, metal content	[r] 6,269	8,332	11,800
Lead, mine output, metal content	58,700	62,800	51,600
Iron and steel, crude steel thousand tons	81	82	[e] 90
Mercury 76-pound flasks	420	1,304	[e] 2,000
Silver, mine output, metal content thousand troy ounces	1,866	2,171	1,432
Zinc, mine output, metal content	97,480	96,500	87,500
NONMETALS			
Barite	160,505	221,000	[e] 161,000
Cement, hydraulic thousand tons	1,273	860	1,381
Gypsum do	[r] 294	295	[e] 300
Lime do	53	59	54
Sand and gravel [2] do	4,352	4,779	5,954
Stone, limestone [2] do	5,387	5,488	6,777
Other [3] do	3,201	2,766	3,095
MINERAL FUELS AND RELATED MATERIALS			
Coal:			
Anthracite thousand tons	90	79	[e] 73
Bituminous do	63	75	63
Coke, gashouse, including breeze do	36	36	[e] 36
Peat:			
Agricultural use do	54	53	57
Fuel use:			
Briquets do	314	319	327
Sod peat [4] do	2,188	2,160	2,183
Milled peat [5] do	3,927	2,881	2,985
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	4,344	4,260	4,208
Jet fuel do	616	488	602
Distillate fuel oil do	4,692	5,326	5,185
Residual fuel oil do	6,307	8,449	9,485
Other do	910	1,035	1,172
Refinery fuel and losses do	750	718	762
Total do	17,619	[r] 20,276	21,414

[e] Estimate. [p] Preliminary. [r] Revised.

[1] In addition to the commodities listed, substantial quantities of stone, and sand and gravel are produced by local authorities for purposes such as road maintenance, but statistics on such output are not reported and available information is inadequate to make reliable estimates of output levels.

[2] Excludes materials produced by local authorities (see footnote 1).

[3] Figures given as reported in source; includes granite, marble, silica rock, sand, calcspar, fire clay, and shale and clays for cement, but apparently excludes those quantities of these materials specified in footnote 1.

[4] Includes production of farmers and by Bord Na Móna.

[5] Includes milled peat used in production of peat briquets listed previously in this table.

TRADE

Because of reduced export trade to the United Kingdom in 1971, the value of metal ore and scrap exports from Ireland declined from $50.4 million in 1970 to $41 million in 1971. Particularly sharp declines were noted in exports of lead and zinc. Lead ore and concentrate exports declined from 145,766 metric tons valued at $17.2 million in 1970 to 114,975 tons valued at $10.14 million in 1971. Zinc ore and concentrate exports fell from 194,329 metric tons valued at $22 million in 1970 to 127,255 tons valued at $15 million in 1971. Imports of crude petroleum rose almost 15 percent.

Table 2.—Ireland: Exports[1] of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum:			
Metal including alloys:			
Scrap	607	566	NA.
Unwrought and semimanufactures	4,708	3,964	United Kingdom 3,658; West Germany 87.
Copper:			
Ore and concentrate	18,451	11,732	Spain 5,776; Canada 3,690.
Metal including alloys:			
Scrap	4,258	4,243	United Kingdom 1,568; Netherlands 968; Spain 524.
Unwrought	980	839	Netherlands 391; Italy 365; West Germany 62.
Semimanufactures	701	682	United Kingdom 379; United States 295.
Iron and steel:			
Scrap	11,361	10,864	France 4,359; Spain 2,548; Sweden 1,213.
Semimanufactures	14,548	17,217	United Kingdom 16,467.
Lead:			
Ore and concentrate	148,308	145,766	Belgium-Luxembourg 51,767; France 32,678.
Metal including alloys:			
Scrap	211	262	United Kingdom 221.
Unwrought and semimanufactures	2,562	2,541	United Kingdom 1,160; France 957; United States 208.
Zinc ore and concentrate	193,548	194,329	France 48,601; Netherlands 29,311; United Kingdom 27,840.
NONMETALS			
Barite and witherite	156,435	222,142	United States 179,231; Norway 9,966; Nigeria 8,514.
Cement thousand tons	102	37	All to United Kingdom.
Clays and products:			
Refractory (including nonclay bricks)	37,422	46,156	United Kingdom 15,823; Netherlands 11,170; Italy 9,649.
Fertilizer materials:			
Manufactured	28,830	18,366	United Kingdom 18,303.
Gypsum and plasters thousand tons	100	108	All to United Kingdom.
Stone, sand and gravel:			
Gravel and crushed rock do	359	305	West Germany 146; United Kingdom 94; Netherlands 46.
MINERAL FUELS AND RELATED MATERIALS			
Coal and coke, including briquets	18,397	183,344	United Kingdom 97,140; Netherlands 51,396; Norway 21,241.
Gas hydrocarbon	15,221	15,338	All to United Kingdom.
Peat including peat briquets and litter	82,551	89,840	United Kingdom 87,136.
Petroleum refinery products (including bunkers):			
Gasoline (including natural) thousand 42-gallon barrels	[r] 157	149	All to United Kingdom.
Kerosine do	[r] 1,686	126	Bunkers.
Distillate fuel oil do	[r] 806	2,388	Bunkers 1,656; United Kingdom 732.
Residual fuel oil do	[r] 2,704	4,017	United Kingdom 3,231; Bunkers 620; Netherlands 132.
Lubricants do	--	28	All to United Kingdom.
Other do	309	302	NA.
Total do	[r] 5,662	7,010	

[r] Revised. NA Not available.

[1] Excludes reexports.

Table 3.—Ireland: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
Metals			
Aluminum metal, including alloys:			
Unwrought	8,335	5,082	Canada 3,174; United Kingdom 1,428; West Germany 350.
Semimanufactures	6,294	6,536	United Kingdom 4,768; West Germany 470; Belgium-Luxembourg 336.
Copper metal, including alloys:			
Unwrought	185	156	United Kingdom 127.
Semimanufactures	8,590	7,965	United Kingdom 7,548; West Germany 137; France 73.
Iron and steel:			
Pig iron, ferroalloys, and similar materials	22,665	29,890	United Kingdom 11,854; Spain 11,849; Poland 3,915.
Steel, primary forms	6,937	5,449	West Germany 3,549; United Kingdom 1,382.
Semimanufactures:			
Bars, rods, angles, shapes, and sections	102,831	100,209	United Kingdom 59,145; West Germany 15,258; Belgium-Luxembourg 10,989.
Universals, plates, and sheets	96,663	89,844	United Kingdom 55,619; Belgium-Luxembourg 8,733.
Hoop and strip	11,527	9,527	United Kingdom 8,601; West Germany 405; Belgium-Luxembourg 395.
Rails and accessories	6,376	3,699	United Kingdom 2,637; West Germany 242.
Wire	22,622	8,127	United Kingdom 6,068; West Germany 1,312.
Tubes, pipes, and fittings	41,507	48,250	United Kingdom 40,090; Netherlands 2,521.
Castings, and forgings, rough	555	339	United Kingdom 326.
Total	282,081	259,995	
Lead:			
Oxides	1,586	1,881	United Kingdom 1,857.
Metals including alloys, all forms	1,281	1,566	United Kingdom 1,423.
Nickel, metal, including alloys, all forms	449	539	United Kingdom 361; Switzerland 107.
Platinum-group metals and silver metal, including alloys:			
Platinum group ____ value, thousands	$190	$183	All from United Kingdom.
Silver, all forms ____ do	$371	$302	United Kingdom $291.
Tin metal including alloys, all forms ____ long tons	100	341	United Kingdom 125.
Titanium oxide	3,265	3,201	United Kingdom 2,094; West Germany 518; Netherlands 265.
Zinc:			
Oxides	686	783	United Kingdom 524.
Metal including alloys:			
Unwrought	4,579	2,767	United Kingdom 2,341; Bulgaria 302.
Semimanufactures	866	890	United Kingdom 804; West Germany 65.
Other, ore and concentrate	20,686	15,581	Republic of South Africa 15,103.
NONMETALS			
Asbestos	6,545	4,350	Cyprus 1,420; Republic of South Africa 1,345; U.S.S.R. 639.
Cement ____ thousand tons	1,526	208	United Kingdom 138; Denmark 50; Belgium-Luxembourg 11.
Clays and products (including nonclay bricks):			
Crude n.e.s	14,802	18,705	United Kingdom 15,512; Greece 2,000.
Products:			
Refractory (including nonclay bricks)	14,799	17,756	United Kingdom 16,845; Canada 456.
Nonrefractory	7,558	7,121	United Kingdom 5,734; West Germany 913.
Fertilizer materials:			
Crude:			
Nitrogenous ____ thousand tons	1	--	
Phosphatic ____ do	339	385	All from Morocco.
Manufactured:			
Nitrogenous ____ do	12	16	United Kingdom 7; Portugal 5.
Phosphatic:			
Thomas slag ____ do	153	152	Belgium-Luxembourg 150; United Kingdom 2.
Other ____ do	17	20	United Kingdom 15; Netherlands 3.
Potassic ____ do	193	253	France 108; West Germany 58; Spain 29.
Other, including mixed ____ do	67	60	United Kingdom 59; Netherlands 1.
Ammonia	39,092	40,235	United Kingdom 22,054; France 9,363; Netherlands 8,800.
Lime	4,441	4,839	All from United Kingdom.

Table 3.—Ireland: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
NONMETALS—Continued			
Magnesite	23,204	22,396	United Kingdom 18,045; People's Republic of China 1,707.
Pyrite (gross weight)	1,256	--	
Salt thousand tons	51	56	United Kingdom 39; West Germany 9; Spain 6.
Sodium and potassium compounds, n.e.s.	6,233	6,560	United Kingdom 6,028.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	5,022	2,448	Italy 981; United Kingdom 785.
Worked	363	218	United Kingdom 215.
Gravel and crushed rock	50,793	64,687	United Kingdom 64,042.
Sand excluding metal bearing	41,543	50,811	Belgium-Luxembourg 36,527; United Kingdom 13,824.
Sulfur:			
Elemental	108,525	120,686	United States 99,693; France 20,662.
Sulfuric acid, including oleum	12,587	--	
Other nonmetals, n.e.s	10,974	14,351	United Kingdom 6,882; Italy 2,989; Mozambique 1,442.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	17,188	10,098	United Kingdom 5,209; Netherlands 2,272.
Coal and coke, including briquets thousand tons	1,167	1,230	Poland 942; United Kingdom 173; United States 32.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	16,997	20,287	Kuwait 6,647; Saudi Arabia 6,029; Iran 4,682.
Refinery products: [1]			
Gasoline do	588	1,176	United Kingdom 935; Italy 127; Israel 127.
Jet fuel do	1,736	1,744	All from United Kingdom.
Kerosine, white spirit, and special boiling point liquids do	576	760	Do.
Distillate fuel oil do	918	1,365	United Kingdom 1,253; Israel 112.
Residual fuel oil do	7,706	8,685	United Kingdom 5,881; U.S.S.R. 1,419.
Liquefied petroleum gases do	290	348	All from United Kingdom.
Lubricants do	266	273	Do.
Bitumen do	24	21	United Kingdom 19.
Other do	2,390	2,362	United Kingdom 707; Netherlands Antilles 476.
Total do	14,494	16,734	

[1] Source: Organization for Economic Cooperation and Development (OCED; Paris), Oil Statistics, Supply and Disposal, 1969.

COMMODITY REVIEW

METALS

Aluminum.—Plans were discussed for the construction of a $144 million alumina plant at Limerick. If built, the plant would treat imported bauxite, producing 600,000 tons of alumina per year for shipment to a new aluminum smelter in Northumberland, United Kingdom.

Copper, Lead, Zinc, Mercury, and Silver.—Production of copper coming mainly from the Avoca, Tynagh, and Gortdrum mines rose during the year. Avoca Mines (Canada) Ltd., controlled by Discovery Mines Ltd. (Canada), established new facilities at its Avoca copper mine in the Wicklow Mountains, south of Dublin.[3] During the first 6 months of 1971, 403,000 tons of ore was milled, including 130,000 tons from old surface dumps and stockpiles, with a total copper content of about 5.5 million pounds for an average grade of 0.79 percent copper. The flotation plant, with a 2,400-ton-per-day existing capacity, was scheduled for expansion to 4,000 tons per day. Copper concentrate was trucked 5 miles to Arklow for shipment to Spain and Sweden. Pyrite concentrate was stored at the mine site for future sale to Nitrigin Eireann Teoranta, an Irish firm building a fertilizer plant that will use the pyrite beginning about 1972 as a source of sulfur.

Outputs of other base metals and silver declined in 1971, although the outlook for future production was brighter than ever. Recent discoveries by Tara Exploration and Development Co. Ltd. at Navan, northwest of Dublin, were being confirmed by continued drilling. By the end of 1971 reserves were placed at more than 20 million tons and possibly as much as 50 million tons of zinc-lead ore averaging 12 to 14 percent combined metal content; generally, one-fifth was lead and the balance zinc. Bulk samples were scheduled to be taken for metallurgical testing, and plans were under consideration to produce at rates on the order of 2 million tons of ore per year. Tara also entered into an agreement with a United Kingdom subsidiary of American Metal Climax, Inc., for the latter to explore Tara's licensed areas in County Wexford.

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[3] World Mining. Avoca is Ireland's Newest Copper Producer in a Historic Mining Center. V. 7, No. 12, November 1971, pp. 50–55.

The Tynagh lead-zinc mine of Irish Base Metals, Ltd., subsidiary of Northgate Exploration, Ltd. (Canada), continued to produce the bulk of the Irish lead output and a significant part of the zinc production.[4] The mine, which began as an open pit, underwent extensive underground development in 1971 in the section known as Zone 2 which contains an estimated 4.5 million tons of ore. The open pit (Zone 1) was estimated to be about three-fourths mined out. Plans were made to phase out the open pit operation while preparing underground facilities for mining at rates of extraction reaching 850,000 tons per year by mid-1973. At the Gortdrum mine, also owned by Northgate Exploration, ore from the open pit was milled at a rate of about 1,500 tons per day, producing mill concentrates containing 30 to 40 percent copper and 20 to 30 ounces of silver per ton plus a small quantity of mercury. Over 2,000 flasks of mercury was expected to be produced in 1971 and marketed in the United Kingdom and Western Europe. Calcined copper concentrates were sent to Limerick and to the Rio Tinto-Patiño, S.A. smelter at Huelva, Spain.

Mogul of Ireland Ltd. developed a new ore zone at its Silvermines lead-zinc mine, near Tynagh, County Tipperary, at a depth of about 500 feet and located 4,000 feet east of the existing main shaft. The new ore body was estimated to contain about 2 million tons of ore grading 3.5 percent lead, 6 percent zinc, and 1 ounce per ton in silver. Production at the mine, all underground, was reduced in 1971 by a 2-month strike, but plans were in progress to expand milling rates from 2,000 to 3,000 tons per day with the additional output from the new zone.

Smelter Corp. of Ireland, Ltd. a subsidiary of Northgate Exploration, continued negotiations toward establishing a proposed $70 million lead-zinc smelter on Little Island at Cork. Local opposition was voiced because of possible pollution problems. The Irish Government was expected to support construction by supplying up to 45 percent of the financing.

Manganese.—Mitsui Mining & Smelting Co., Ltd., of Japan planned construction of an approximately $8 million electrolytic manganese plant in Ireland in conjunction with the proposed lead-zinc smelter of Smelter Corp. of Ireland. The plant, to produce up to 12,000 tons per year of manganese dioxide, chiefly for dry cell battery use, would rely on the smelter for an adequate and low cost supply of sulfuric acid, necessary for the manganese ore processing. Ores were to be imported primarily from Ghana and Gabon.

NONMETALS

Output of most nonmetallic minerals rose in 1971. The new seawater and dolomite magnesia plant of Quigley Magnesite Division, Pfizer, Inc. (U.S.), operated the full year at Dungarvan, County Waterford Barite continued to be produced by Magcobar (Ireland) Ltd. in County Tipperary, mainly for U.S. markets. Cement was produced in greater quantity by Cement Ltd. at two locations, Drogheda and Limerick, with operations continuous through the year.

MINERAL FUELS

Ireland in 1971 depended largely on imported oil and coal for its primary energy supplies. Other domestic energy sources were peat, produced largely by Bord na Móna, a State organization; a small output of coal; and hydroelectricity, produced under authority of the Electricity Supply Board, a State organization with a monopoly on electricity production and distribution. All gas continued to be produced from imported coal or oil, although natural gas was discovered offshore during the year (see the petroleum section, this chapter). Oil and peat supplied about seven-eighths of the power for electrical generation. Plans were considered for construction of a $200 million, 500-megawatt nuclear power station by the Electricity Supply Board, and specifications were drawn up. Selection was due in 1972 from one of five coastal sites for the plant, and a 1980 completion date was proposed.

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[4] Mining Magazine (London). Major New Developments Underway at Ireland's Base Metal Mines. V. 126, No. 1, January 1972, pp. 13–25.

Coal, Coke, and Peat.—Output of sod, and milled peat increased in 1971, but production of anthracite and bituminous coal continued to decline. The quantity of briquets manufactured from peat increased and significant quantities of these briquets and of agricultural peat were exported, with the United Kingdom the principal destination. Imports of coal and coke included gas coal from Poland, as in the past.

Petroleum.—In late 1971 Marathon Petroleum (Ireland) Ltd. announced discovery of an apparently significant natural gas field in offshore waters about 27 miles from the Old Head of Kinsale in about 310 feet of water. A flow rate of 27.6 million cubic feet per day was recorded through a 0.5-inch choke in tests 2,700 to 3,050 feet below the surface. The discovery hole was drilled to 6,549 feet total depth, and other gas producing zones were noted. The gas from the drill hole was lit, and the flare was visible for miles. Further testing and exploration in the area was suspended for the winter months. Under Marathon's production agreements with the Irish Government, the firm must pay the Government 12.5 percent of the market value at the wellhead of any gas produced, after certain allowances. Also, any oil or gas found must be delivered to Ireland unless the Government consents to delivery elsewhere.

Ireland imported 22.23 million 42-gallon barrels of crude petroleum in 1971, nearly 10 percent more than in 1970, and of this, 57 percent came from Kuwait, 26 percent from Iran, 16 percent from Saudi Arabia, and nearly all of the balance from Southern Yemen. Partly refined petroleum totaling 0.78 million barrels was imported from the United Kingdom and Italy in 1971. Estimated consumption of refined products, as reported by a principal Irish distributor, was 32.12 million barrels, including bunker fuels. Consumption, excluding bunkering of foreign aircraft was as shown below, in thousand metric tons:

Product	1970	1971
Gasolines	609	669
Aviation fuels	73	392
Kerosine	104	93
Gas/diesel oil	745	872
Residual fuel oil	2,040	2,401
Other	198	200
Total	3,769	4,627

Source: Organization for Economic Cooperation and Development (OECD; Paris). Provisional Oil Statistics by Quarters (4th Quarter 1971), 1971.

The Mineral Industry of Israel

By Donald E. Eilertsen [1]

Israel continued its efforts to stimulate greater industrial and agricultural growth and bolster the country's exports. Based on the new rate of exchange, 4.2 Israel pounds (IS£) per U.S. dollar in 1971 compared with 3.5 IS£ per U.S. dollar in 1970, the country's gross national product (GNP) rose to an estimated $5.220 billion in 1971 compared with $4.394 billion in 1970 and $1.046 billion in 1960. The increase in GNP from 1970 was 18.8 percent compared with an average annual growth rate of 15.7 percent since 1960.[2] The mineral share of GNP is small but important to the economy.

Some outstanding features of the mineral and mineral-associated industries in 1971 were as follows: Development of new copper reserves which will greatly prolong the life of that industry; an increase in bromine capacity to 14,500 tons per year; high outputs in the ceramic and glass industries; and new production of phosphoric acid, ammonia, and urea. Developments in the petroleum area included the discovery of a small but important new reserve of oil; the extraction of 6 million tons of crude oil from the Sinai field in administered territory; the growing capability of the Eilat-Ashkelon 42-inch oil transit pipeline; and construction of a second oil refinery.

PRODUCTION

Production data on a few mineral commodities were not available for 1971, so estimates of them were made. Bromine, potash, salt, and sulfur increased in production in 1971 compared with 1970. Other commodities such as cement-copper, natural gas, and crude petroleum declined in output, but figures for crude petroleum do not include Israeli production from the Sinai oilfields. Outputs of cement, gypsum, lime, and peat were unchanged.

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[1] Physical scientist, Division of Nonmetallic Minerals.

[2] Agency for International Development. AID Economic Data Book. Near East and South Asia. Israel, Selected Annual Trends. Rev. No. 321, February 1972.

Table 1.—Israel: Production of mineral commodities

(Thousand metric tons unless otherwise specified)

Commodity [1]	1969	1970	1971 [p]
METALS			
Copper-cement, 70 to 80 percent Cu, gross weight .... metric tons	10,683	10,988	10,700
Iron and steel, crude steel [e]	120	120	120
NONMETALS			
Bromine:			
Elemental .... metric tons	10,550	[2] 8,000	[e] 8,800
Compounds .... do	3,626	[2] 4,000	[e] 4,400
Cement, hydraulic	1,308	1,380	1,380
Clays, flint	15	100	NA
Fertilizer materials:			
Crude:			
Phosphatic, beneficiated	[r] 994	1,162	[e] 665
Potash:			
Gross weight	[r] 607	909	[e] 1,000
Potassium oxide (K_2O) equivalent	[r] 370	554	[e] 610
Manufactured:			
Nitrogenous [e]	100	100	105
Phosphatic (superphosphate)	150	170	[e] 176
Potassic	2	2	[e] 3
Gypsum	71	70	[e] 70
Lime [e]	130	130	130
Salt, marketed (mainly marine)	67	66	[e] 78
Sulfur [e]	8	8	10
MINERAL FUELS AND RELATED MATERIALS			
Gas, natural, marketed .... million cubic feet	4,873	4,752	4,370
Peat [e]	20	20	20
Petroleum:			
Crude [3] .... thousand 42-gallon barrels	719	566	[e] 470
Refinery products:			
Gasoline .... do	[e] 6,279	4,072	NA
Kerosine and jet fuel .... do	[e] 5,460	4,263	NA
Distillate fuel oil .... do	[e] 8,268	7,288	NA
Residual fuel oil .... do	[e] 12,870	16,737	NA
Other .... do	[e] 3,588	2,471	NA
Refinery fuel and losses .... do	[e] 2,536	[e] 1,393	NA
Total .... do	[e] 39,001	36,224	NA

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, ball clay, fire clay and a wide variety of crude construction materials, such as dimension stone, crushed rock, sand and gravel are produced, but available information is inadequate to make reliable estimates of output levels.

[2] Sales.

[3] Does not include Israeli production from occupied Sinai Peninsula oilfields.

TRADE

Most of Israel's exports and imports of mineral commodities in 1970 were larger than those in 1969.

Some of the exports which were larger in 1970 were: Aluminum metal, all forms, 16.6 percent; cement-copper, 1.7 percent; iron and steel semimanufactures, 110.3 percent; bromine, 18.1 percent; clays and clay products, 41.5 percent; fertilizer materials, 15.8 percent; and crude and partly refined petroleum, 86.2 percent. Many exports were smaller in 1970; the declines of cement and clinker, salt and brines, and sulfur were very large.

Israel imports many mineral commodities. Some of the large-quantity commodities which showed gains in imports in 1970 were aluminum metal, 14.3 percent; copper metal, 123 percent; iron and steel semimanufactures, 1.9 percent; silver, 16.3 percent; and clays and clay products, 2.5 percent.

Table 2.—Israel: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum including alloys, all forms	r 2,411	2,812	Italy 475; West Germany 256; Uganda 241; United Kingdom 231; Belgium 217; Netherlands 187; Kenya 176.
Copper:			
Concentrate (cement-copper)	16,755	17,038	Spain 7,542; Greece 2,882; Hungary 2,425.
Metal including alloys, all forms	4,137	4,262	Belgium 1,526; Spain 989; Switzerland 750.
Iron and steel:			
Scrap	1,981	2,129	Greece 1,480; Belgium 329.
Sponge iron, powder etc	--	8	United States 5; Other countries 3.
Semimanufactures:			
Tubes, pipes and fittings	r 5,414	11,285	Romania 3,192; United States 1,493; Iran 1,096; Bulgaria 1,054; Uganda 946.
Other	r 103	319	Mainly to Italy.
Lead including alloys, all forms	663	817	United Kingdom 524; Belgium 231.
Magnesium including alloys, all forms	13	--	
Nickel including alloys, all forms	61	447	Mainly to United States.
Silver including alloys troy ounces	1,286	--	
Zinc including alloys, all forms	r 368	432	Republic of South Africa 299; Belgium 91.
Other base metals including alloys, all forms	--	18	Belgium 6; United Kingdom 6.
NONMETALS			
Bromine and products	r 5,286	6,241	United Kingdom 2,115; Netherlands 883; Hungary 867.
Cement and clinker	98,315	1,850	Mainly to Malta.
Clays and products:			
Crude n.e.s	5,059	8,160	West Germany 6,281; Netherlands 1,207.
Products, refractory	r 4,947	6,002	Greece 4,019; West Germany 1,092.
Diamond, gem not set or strung thousand carats	1,775	1,778	United States 676; Hong Kong 236; Belgium 211; Japan 147.
Fertilizer materials:			
Crude:			
Phosphatic	r 793,306	529,583	Romania 175,301; Italy 120,655; France 69,409.
Other	1,452	5,003	All to Cyprus.
Manufactured:			
Nitrogenous	102	179	Mainly to Ethiopia.
Phosphatic	49,714	241,125	Netherlands 82,684; Hungary 45,078; United Kingdom 26,367.
Other including mixed	r 564,548	855,365	France 216,240; Japan 131,390; United Kingdom 96,185; Brazil 77,942; United States 66,195.
Lime	60	--	
Precious and semiprecious stones, except diamond value, thousands	$638	$952	Switzerland $334; United Kingdom $252; United States $132.
Salt and brines	793	191	Malaysia 121; Thailand 70.
Sodium and potassium compounds n.e.s	r 3	100	All to Ethiopia.
Stone:			
Dimension:			
Crude and partly worked	78	94	Republic of South Africa 36; United States 31.
Worked	2	55	Republic of South Africa 35; Canada 20.
Dolomite chiefly refractory grade	4	--	
Sulfur:			
Elemental, all forms	1,273	47	Iran 30; Thailand 13.
Other n.e.s., building materials of asphalt, asbestos and fiber, cement and unfired n.e.s	10,878	4,449	Nigeria 1,212; Singapore 933; Kenya 605; Ghana 465.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	35	15	Mainly to Uganda.
Carbon black and gas carbon	8,243	5,633	Turkey 1,622; United States 1,297; Austria 880.
Hydrogen, helium, and rare gases	4	8	All to Iran.
Petroleum:			
Crude and partly refined e thousand 42-gallon barrels	16,750	31,181	NA.
Refinery products:			
Gasoline (including natural) do	2,420	--	
Kerosine and jet fuel do	2,019	20	NA.
Distillate fuel oil do	2,763	1,354	NA.
Residual fuel oil do	1,555	2,500	NA.
Other do	862	218	NA.

e Estimate. r Revised. NA Not available.

Table 3.—Israel: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum:		
Bauxite and concentrate	100	21
Oxide and hydroxide	r 659	718
Metal including alloys, all forms	r 15,320	17,504
Arsenic trioxides, pentoxide, and acids	9	523
Chromium oxide and hydroxide	r 64	86
Copper:		
Matte	42	84
Metal including alloys, all forms	r 15,210	33,901
Gold, unworked or partly worked troy ounces	r 60,192	12,378
Iron and steel:		
Scrap	r 149	739
Pig iron including cast iron	13,989	19,267
Sponge iron, powder, and shot	r 400	1,646
Spiegeleisen	250	297
Ferroalloys	r 1,416	1,351
Steel, primary forms	199	5,069
Semimanufactures:		
Bars, rods, angles, shapes, sections	r 146,481	177,478
Universal plates and sheets	r 289,869	258,931
Hoop and strip	r 9,273	9,640
Rails and accessories	r 555	588
Wire	r 8,370	18,344
Tubes, pipes, and fittings	r 20,762	18,672
Castings and forgings, rough	r 1,993	1,722
Ingots and semimanufactures, high carbon and alloys	r 17,138	18,629
Lead:		
Oxides	r 780	744
Metal including alloys, all forms	2,266	2,918
Magnesium including alloys, all forms	r 138	288
Manganese oxide	r 390	220
Mercury 76-pound flasks	r 319	377
Molybdenum including alloys, all forms	4	4
Nickel including alloys, all forms	r 250	223
Platinum group including alloys, all forms troy ounces	r 46,104	7,716
Silver including alloys do	r 1,003,391	1,167,167
Tin:		
Oxides long tons	2	3
Metal including alloys, all forms do	r 176	554
Titanium oxide	r 2,422	2,469
Tungsten including alloys, all forms	1	26
Zinc:		
Oxide	r 40	18
Metal including alloys, all forms	r 6,364	4,233
Other:		
Ore and slag	r 468	188
Ash and residue containing nonferrous metals	r 2,269	6
Oxides, hydroxides, and peroxides of metals n.e.s	r 206	242
Base metals including alloys, all forms	r 69	154
NONMETALS		
Abrasives, n.e.s.:		
Pumice, emery, natural corundum, etc	r 158	245
Corundum, artificial	r 306	270
Asbestos	r 8,650	7,589
Barite and witherite	r 3,025	2,278
Boron materials, oxide and acid	r 247	335
Cement	r 34,430	34,101
Chalk	r 191	303
Clays and products (including refractory brick):		
Crude kyanite, andalusite, etc	r 31,904	30,174
Products:		
Refractory (including nonclay brick)	r 3,756	2,340
Nonrefractory thousand square meters	r 233	4,287
Cryolite and chiolite	r 40	88
Diamond:		
Gem not set or strung thousand carats	r 4,446	3,885
Industrial do	r 659	404
Diatomite and other infusorial earths	r 870	484
Feldspar and fluorspar	r 1,530	--
Fertilizer materials manufactured:		
Nitrogenous	r 7,623	13,168
Other including mixed	r 184	34
Graphite, natural	r 92	48
Gypsum and plasters	r 150	151
Magnesite	r 1,520	1,108
Mica, all forms	r 146	95
Pigments, minerals, including iron oxides	r 475	476
Precious and semiprecious stones, except diamond value thousands	$1,119	$1,660
Salt	57	146
Sodium and potassium compounds n.e.s	r 1,168	2,471

See footnote at end of table.

Table 3.—Israel: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970
NONMETALS—Continued		
Stone, sand and gravel:		
Dimension stone crudely and partly worked:		
Calcareous	[r]547	860
Slate	[r]186	12
Other	[r]35	240
Gravel and crushed rock	[r]3,374	5,048
Quartz and quartzite	[r]604	661
Sand excluding metal bearing	[r]253	139
Sulfur:		
Elemental, all forms	[r]58,107	40,951
Sulfuric acid	38,640	27,876
Talc, steatite, soapstone, and pyrophyllite	[r]1,960	2,603
Other n.e.s.:		
Crude	[r]223	495
Oxides and hydroxides of magnesium, strontium, and barium	[r]78	109
Building materials of asphalt, asbestos and fiber cement, and unfired n.e.s	[r]147	54
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	150	131
Carbon black and gas carbon	[r]3,006	2,024
Coal and coke, including briquets	[r]885	2,379
Peat including peat briquets and litter	[r]399	360
Petroleum:		
Crude and partly refined [e] ... thousand 42-gallon barrels	[1]40,535	37,360
Refinery products: [e]		
Gasoline (including natural) ... do	140	140
Kerosine and jet fuel ... do	--	375
Distillate fuel oil ... do	--	750
Residual fuel oil ... do	3,330	2,220
Lubricants ... do	156	74
Other ... do	106	1,179
Mineral tar and other coal, petroleum, or gas derived crude chemicals	[r]1,099	2,571

[e] Estimate. [r] Revised.

[1] Includes estimated receipts from Israeli-occupied Sinai Peninsula oilfields.

COMMODITY REVIEW

METALS

Copper.—Timna Copper Mines Ltd. has mining, milling, and leaching facilities at Timna, 18 miles north of Eilat which produce about 33 metric tons of copper equivalent per day in the form of cement-copper, assaying 70 to 80 percent copper. The product is shipped to smelters in Europe for the extraction of copper. Open pits and an underground mine, Timna I, supply ore to the mill which can handle 3,400 tons of ore per day. Recently, an extension of the ore body was discovered containing 10 million tons of ore. The firm was developing a new mine, Timna II, to mine the new reserve. Altogther, the company's proven reserves of ore are estimated at 11 million tons containing 1.8 percent copper, but this does not include unspecified tonnages of possible and probable ores.[3]

Iron.—The occurrences of iron ore in the Menuha Ridge area in southern Negev were studied. The area contains two principal exposures of iron ore which, although high in grade, are too small to justify exploitation. Exploration by drilling was suggested.[4] Israel produces small tonnages of crude steel; it also imports about a half million tons of iron and steel products per year.

NONMETALS

Brines.—Dead Sea brines reportedly contain the following quantities of salts per liter of brine: 130 grams of magnesium chloride, 87 grams of sodium chloride, 37 grams of calcium chloride, 11.5 grams of potassium chloride, 5 grams of magnesium bromide, and 1 gram of calcium sulfate. The reserves of salts in the Dead Sea have been estimated at 22 billion tons of magnesium chloride, 12 billion tons of sodium chloride, 6 billion tons of calcium chloride, 2 billion tons of potassium chloride, and 1 billion tons of magnesium bromide. In addition, the Dead Sea also contains some cesium, rubidium, cobalt, and manganese.[5]

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[3] Mining World. How Timna Copper Mines Increased Output and Raised Worker Efficiency. V. 7, No. 1, January 1971, pp. 36–41.

[4] Shraga, Menahem G. The Hydrothermal Iron Deposits of the Menuha Ridge. Israel J. of Earth Sci., v. 20, No. 2, 1971, pp. 51–88.

[5] Mining Magazine. Israel Potash Production. V. 124, No. 5, May 1971, pp. 391–397.

Bromine.—Dead Sea Bromine Co. recently increased its bromine capacity from 13,000 to 14,500 tons per year. The company was also planning to add another 5,500 tons per year of new capacity by mid-1973. Part of the extra supply may go to the United Kingdom for making bromine compounds and flame retardants. Bromine's largest market is for ethylene dibromide which is used in leaded gasoline, a use that may be phased out due to air pollution restrictions. However, other expanding markets and new uses are expected to absorb the increased supply of bromine.

Currently, bromine is shipped in 5-ton lead-lined steel tanks capable of holding 3.5 tons of bromine. Larger tanks rated at 14 tons of bromine will soon be put into service.[6]

U.S. investors recently bought 35 percent of the shares of Dead Sea Bromine Co., a subsidiary of Dead Sea Works Ltd., (DSW) which recovers potash and other products from brines.[7]

Chlorine. — Electrochemical Industries Ltd. (Frutarom), jointly owned by Israeli interests and a group from Cleveland, Ohio, reportedly was planning to enlarge the capacity of its polyvinyl chlorine resins (PVC) complex at Acre near Haifa. Joint output of chlorine and caustic soda, thought to be about 10,000 tons per year, will be trebled and the PVC capacity will be increased from 9,000 to 24,000 tons per year. Dead Sea brines provide the raw material for manufacture of chlorine and caustic soda.[8]

Clays and Sand.—The ceramic and glass industries use indigenous clays and sand whenever possible, but large quantities of additional raw materials must be imported to supplement domestic supplies. Israel's research center at Haifa is active in developing new materials for these industries.

Large quantities of tile, dishes, sanitaryware, refractories, porcelains, components for electronics, flat glass, and glass containers are produced. Barbour Acre Ceramic Industries Ltd., near Haifa, produces approximately 20,000 square feet of tile daily. Israel Ceramic Works Harsa Ltd., at Beer-Sheba, produces about 1,000 tons of tile and sanitaryware products monthly. Lapid Ceramic Works Ltd., Tel-Aviv, produces dinnerware and sanitaryware, and Naaman Ltd., Haifa, dinnerware and electrical porcelain. Tadiran Israel Electronic Industries Ltd. consumes large quantities of ceramic materials in the manufacture of electronics. Phoenicia Ltd. produces 40 million square feet of flat glass and 22,000 tons of glass containers per year.[9]

Fertilizers.—Israel has 21 phosphate deposits (including 16 large ones), but only three are being worked. Chemicals & Phosphates Ltd. (C & P) has two mines, one near Oron and the other about 20 kilometers eastward. Arad Chemical Industries Ltd. has one mine, about 17 kilometers south of Arad. Details on the mineralogy, geology, and extraction problems concerning Israel's phosphate deposits have been described.[10]

Arad Chemical Industries Ltd's new phosphoric acid plant came on stream during 1971. The plant will ultimately produce 230,000 tons of wet-process phosphoric acid (160,000 tons of P_2O_5 equivalent) per year by 1974. The high-strength phosphoric acid is prepared by acidulating domestic phosphate rock with hydrochloric acid derived from Dead Sea brines. The plant was built at a cost of about $45 million, with most of the output destined for export.[11]

C & P made some test runs at its new ammonia and urea facilities at Haifa early in the year. The ammonia plant has a capacity of 67,900 metric tons of equivalent nitrogen per year, whereas the urea units can produce 33,000 tons of urea yearly.[12]

DSW has capacity to produce 1 million tons of potassium chloride per year from three plants at Sodom. An additional 200,000-ton capacity can easily be added with small investment. Israel exports substantial potash.

Stone.—Lime & Stone Production Co. of Haifa has a network of modern quarries which produce marble, basalt, limestone, and gypsum. The company also produces hydrated lime and plaster of paris. Many of the products are exported to Europe, North America, and South Africa. Recently, the famed Jerusalem stone, for facing buildings, was added to the list of export materials.[13]

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[6] European Chemical News. Dead Sea Bromine Increases Capacity. V. 20, No. 504, Oct. 29, 1971, p. 4.

[7] U.S. Bureau of Mines. Mineral Trade Notes. V. 68, No. 11, November 1971, p. 8.

[8] European Chemical News (London). Israel Plans PVC Complex Extension. V. 19, No. 473, Mar. 26, 1971, p. 14.

[9] Ceramic Industry. Ceramics in Israel. V. 97, No. 6, December 1971, pp. 21–43.

[10] World Survey of Phosphate Deposits. British Sulphur Corp. Ltd., 1971, 3d ed., pp. 123–126.

[11] Chemical Engineering. V. 78, No. 7, Mar. 22, 1971, p. 43.

[12] Nitrogen. No. 69, January–February 1971, p. 13.

MINERAL FUELS

Natural Gas.—Reserves of natural gas in Israel are depleting rapidly and the supply is expected to last only a few years.

Petroleum.—Five wells in Israel, including two offshore, were drilled for oil or gas during 1971. "Kokhav 25" in the Helez-Kokhav field, the country's lone producing field, was the only well that struck oil. The estimated reserve for this well was only 250,000 barrels.[14]

Belco Petroleum Corp. finished drilling offshore for oil and gas without success. Six holes were drilled between Ashkelon and Haifa since 1970.

Israel obtained about 6 million tons of crude oil worth about $80 million in 1971 from the Sinai fields in administered territory.

The Eilat-Ashkelon 42-inch pipeline handled 19.5 million tons of crude oil in 1971 and is expected to transport about 30 million tons in 1972 and 40 million tons in 1973. The maximum capacity of the pipeline is 60 million tons per year. The pipeline bypasses the Suez Canal and greatly shortens the distance for transporting oil from the Red Sea to Europe. The Red Sea terminal at Eilat has facilities to take care of tankers up to 300,000 dead weight tons (d.w.t.) whereas the Ashkelon terminal on the Mediterranean Sea can only handle tankers up to 150,000 d.w.t. Israel's tanker fleet totaled 3.3 million d.w.t. in 1970.

Haifa Refineries Ltd. started to build a new 4.25 million-ton-per-year refinery at Ashdod. It will be the second refinery for both the company and Israel. The new refinery will go on stream in 1973 and have about two-thirds the capacity of the present refinery.

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[13] Rock Products. V. 74, No. 2, February 1971, p. 92.

[14] Israel Oil News. Israel Institute of Petroleum. January 1972, 46 pp.

The Mineral Industry of Italy

By Andrew Kuklis[1]

Despite a worldwide recession and an uncertain international monetary climate, Italy's output of goods and services rose to $72.2 billion from the $71.2 billion reported in 1970.[2] However, the less than 2 percent gain in the nation's economy for 1971 was the smallest increase in the gross national product (GNP) for the postwar period. For the first time since 1950, the industrial sector, accounting for over one-third of the GNP, failed to increase in output over that of the previous year. A decline in construction, manufacturing, and mining activity had a negative effect on the industrial sector. Despite a decline in the industrial sector, the nation's GNP rose slightly because of increases in output generated in the agricultural and service sectors of the economy.

Foreign investments in Italy dropped to $63.1 million from the $99.4 million reported in 1970. France accounted for over 30 percent of the total foreign investments. Italy's expanding hydrocarbon industry received most of the monies invested by foreign countries.

PRODUCTION

The general index of production for the mining industry in 1971 decreased more than 6 percent compared with the 1970 index. In metal mining, all metallic minerals declined except magnesium, silicon, and silver. Lower production was reported for all commodities in the mineral fuel sector except natural gas. Only the production of asbestos, feldspar, sulfur ore, and rock salt was higher than in 1970; the remaining nonmetals declined. The total value of 1971 mineral output was $510 million, a decline of 3 percent compared with that of 1970.

Performance of the different sectors in the mining industry are shown in the following tabulation:

Sector	Index (1966 = 100)	
	1970	1971
Metallic minerals	106.1	95.9
Nonmetallic minerals	115.3	108.0
Marble, building stone	r 147.0	135.2
Solid fuels	127.2	115.3
Petroleum and natural gas	126.9	127.6
Total mining	124.5	116.4

r Revised.

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[1] Mining engineer, Division of Ferrous Metals.

[2] Where necessary, values have been converted from Italian Lire (IL) to U.S. dollars at the rate of IL625=US$1.00.

Table 1.—Italy: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971[p]
METALS			
Aluminum:			
Bauxite	216,464	224,703	190,847
Alumina	291,979	313,643	262,608
Metal:			
Primary	[r] 143,637	146,744	136,413
Secondary	128,000	154,000	150,000
Antimony mine output, metal content	1,284	1,299	1,175
Cadmium smelter output	422	425	356
Copper:			
Mine output, metal content	2,270	2,113	1,540
Precipitate, metal content	2,400	2,000	--
Metal, secondary only	16,500	13,700	9,500
Iron and steel:			
Iron ore and concentrate[1] thousand tons	763	757	683
Pig iron do	7,795	8,354	8,554
Ferroalloys:			
Blast furnace do	15	22	18
Electric furnace do	152	175	174
Crude steel do	16,428	17,277	17,452
Steel semimanufactures:			
Hot rolled:			
Wire rod do	832	887	933
Sections do	5,014	5,324	5,075
Plates and sheets do	5,671	5,534	6,007
Strip do	923	999	854
Railway track material do	134	142	190
Ingots, semis and solids for tubes do	1,068	1,106	1,082
Other do	713	772	724
Total hot rolled do	14,355	14,764	14,865
Castings and forgings do	333	361	328
Cold-rolled sheet do	2,896	2,941	3,171
Lead:			
Mine output, metal content	36,982	35,200	31,600
Metal:			
Primary	62,325	54,288	48,392
Secondary	17,700	25,000	27,400
Magnesium metal, primary	[r] 7,103	7,580	7,707
Manganese ore, gross weight	52,966	50,091	30,604
Mercury metal 76-pound flasks	48,733	44,469	42,613
Silicon, elemental	19,193	20,220	22,190
Silver metal thousand troy ounces	1,834	1,063	1,236
Tungsten mine output, metal content kilograms	515	--	--
Zinc:			
Mine output, metal content	132,300	110,700	105,900
Metal, primary	130,321	142,082	139,823
NONMETALS			
Asbestos	112,526	118,518	119,568
Barite	245,825	223,061	201,526
Cement, hydraulic thousand tons	31,348	33,121	31,730
Clays, crude:			
Bentonite do	277	321	296
Fire do	286	322	294
For cement do	4,444	4,289	NA
For common brick do	29,290	27,248	NA
Fuller's earth do	129	73	75
Kaolin do	114	101	96
Kaolinitic earth do	16	10	15
Diatomite	59,736	59,220	[e] 60,000
Feldspar	212,645	176,905	192,498
Fertilizer materials:			
Crude potassium salts, natural thousand tons	1,954	1,894	1,785
Manufactured, gross weight:			
Nitrogenous do	3,108	2,972	2,932
Phosphatic do	1,426	1,406	1,269
Potassic do	343	365	280
Mixed and unspecified do	1,719	1,762	1,582
Fluorspar, all grades	258,708	289,266	288,243
Graphite, all grades	1,719	2,088	638
Gypsum (except dimension stone use) thousand tons	3,367	3,329	[e] 3,500
Lime (quicklime and hydrated) do	5,795	[e] 5,800	[e] 5,800
Pumice and related materials:			
Pumice and pumaceous lapilli do	776	770	[e] 770
Pozollan do	4,324	4,258	[e] 4,300

See footnotes at end of table.

Table 1.—Italy: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971[p]
NONMETALS—Continued			
Pyrite, all kinds:			
Gross weight ... thousand tons	1,473	1,518	1,504
Sulfur content ... do.	663	683	646
Salt:			
Marine, crude ... do.	1,147	1,497	1,170
Other including brine ... do.	2,800	2,871	3,393
Sand and gravel:			
Silica sand ... do.	4,486	4,829	NA
Volcanic sand ... do.	200	143	
Other sand and gravel ... do.	58,794	64,964	
Stone:			
Dimension stone:			
Calcareous:			
Alabaster and onyx ... do.	8	8	NA
Gypsum for cutting ... do.	92	120	
Limestone ... do.	291	163	
Marble in blocks:			
White ... do.	827	848	
Colored ... do.	1,153	1,129	
Lime schist ... do.	56	48	
Travertine ... do.	411	423	
Tufa, calcareous ... do.	1,558	1,600	
Other:			
Breccia ... do.	20	11	NA
Diorite ... do.	5	10	
Gneiss ... do.	144	152	
Granite ... do.	69	57	
Lava, basalt, and trachyte ... do.	120	115	
Porphyry ... do.	166	184	
Quartz and quartzite ... do.	42	10	
Sandstone ... do.	99	159	
Serpentine ... do.	291	304	
Slate ... do.	67	65	
Syenite ... do.	5	5	
Tuff, volcanic ... do.	238	289	
Crushed and broken:			
Calcareous:			
Dolomite ... do.	1,099	1,189	NA
Limestone ... do.	41,204	41,908	NA
Marble, white and colored ... do.	1,771	1,637	NA
Marl for cement ... do.	5,777	6,439	6,813
Travertine ... do.	325	373	NA
Tuff, volcanic ... do.	5,272	4,104	NA
Strontium minerals	925	845	835
Sulfur, native:			
Ore	419,068	354,218	573,823
Concentrate (85 to 90 percent sulfur)	64,046	54,720	42,126
Fused in briquets	1,320	1,681	14,325
Talc and related materials	139,954	154,818	137,868
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bituminous rock, natural:			
For distillation	126,776	111,199	58,648
For paving	85,865	93,455	109,126
Carbon black	104,252	123,559	125,143
Coal:			
Subbituminous (sulcis coal) ... thousand tons	303	295	256
Lignite ... do.	1,933	1,393	1,326
Coke:			
Metallurgical ... do.	6,670	7,171	7,068
Gashouse ... do.	192	125	113
Gas, natural, marketed production ... million cubic feet	422,335	463,953	472,845
Petroleum:			
Crude oil ... thousand 42-gallon barrels	9,309	9,575	9,354
Refinery products:			
Gasoline ... do.	107,184	109,066	112,172
Jet fuel ... do.	13,144	12,128	14,778
Kerosine ... do.	25,515	25,622	32,081
Distillate fuel oil ... do.	148,373	171,222	177,093
Residual fuel oil ... do.	328,457	363,683	359,316
Lubricants ... do.	3,674	4,704	3,818
Other ... do.	88,953	131,765	128,651
Refinery fuel and losses ... do.	67,617	64,932	63,967
Total ... do.	782,917	883,122	891,876

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] Excluding pelletized iron oxide derived from pyrite.

TRADE

Despite a recession throughout the nation's economy and the world's monetary problem, value of foreign trade reached record levels. Exports to foreign countries rose to $15 billion, an increase of over 13 percent compared with the 1970 level. Data on imports indicated an increase of nearly 6 percent in purchases abroad.

Italy's export-import volume of goods was valued at nearly $31 billion and accounted for about one-third of the nation's GNP. For comparative purposes, United States foreign trade accounted for only 6 percent of GNP. Percentage-wise, Italy's value of foreign trade to GNP exceeded that of West Germany, Japan, and the United Kingdom.

Italy is self-sufficient in—and in some case a net exporter of—antimony, asbestos, fluorspar, marble, mercury, potash, and rock salt. For all other minerals and ores, the nation is a net importer and will be increasingly so in the future as newly constructed metal processing plants increase raw material requirements.

Relationships between mineral commodity trade and total trade in 1969 and 1970, and the principle items constituting Italy's mineral commodity trade, are shown in the following tables.

Table 2.—Italy: Exports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum:			
Bauxite	25	2,888	Switzerland 2,189; West Germany 537.
Oxide and hydroxide	[r]8,658	10,925	Austria 8,580; Bulgaria 200.
Metal including alloys:			
Scrap	63	77	West Germany 53; Israel 22.
Unwrought	7,599	5,007	United Kingdom 1,680; West Germany 1,130; Yugoslavia 995.
Semimanufactures	49,951	41,495	France 6,395; West Germany 6,178; Romania 5,461; United States 3,911.
Antimony	236	1,014	West Germany 632; Netherlands 103.
Arsenic:			
Natural sulfides	20	--	
Trioxide, pentoxide and acids	114	25	All to West Germany.
Bismuth	3	19	Netherlands 17.
Cadmium metal including alloys, all forms	39	83	United States 27; Belgium-Luxembourg 26.
Chrome, chromite	119	245	Austria 195; Yugoslavia 50.
Cobalt	30	(1)	NA.
Copper:			
Ore and concentrate	8,385	9,549	Spain 8,570; East Germany 832; Austria 147.
Matte	21	5	All to Algeria.
Metal including alloys:			
Scrap	743	1,056	West Germany 449; Austria 304; Belgium-Luxembourg 246.
Unwrought	5,087	5,880	West Germany 5,003; France 343; Belgium-Luxembourg 319.
Semimanufactures	25,401	20,856	West Germany 4,351; France 2,190; Switzerland 2,143.
Iron and steel:			
Ore and concentrate	77	77	Switzerland 50; Yugoslavia 25.
Roasted pyrite thousand tons	367	439	Austria 219; West Germany 104; Netherlands 79.
Metal:			
Scrap do	19	14	West Germany 7; France 3; Netherlands 2.
Pig iron including cast iron, spiegeleisen, powder and shot do	4	9	Turkey 3; France 2; West Germany 1; Netherlands 1.
Ferroalloys do	18	17	West Germany 9; Austria 2; Sweden 1.
Steel, primary forms do	130	223	France 61; United States 45; Switzerland 32.
Semimanufactures:			
Bars, rods angles, shapes, and sections do	531	561	West Germany 188; Switzerland 70; France 70.
Universals, plates and sheets do	566	439	West Germany 98; France 83; Yugoslavia 36; Switzerland 35; Bulgaria 30.
Hoop and strip do	59	71	Pakistan 17; France 10; Yugoslavia 8; Greece 8; Switzerland 7.

See footnotes at end of table.

Table 2.—Italy: Exports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS—Continued			
Iron and steel—Continued			
Metal—Continued			
Semimanufactures—Continued			
Rails and accessories thousand tons	7	14	Guinea 5; Switzerland 4; Turkey 3.
Wire do	22	19	Algeria 4; Switzerland 2; Hungary 2; Romania 1.
Tubes, pipes, and fittings do	545	412	United States 50; Netherlands 38; United Kingdom 34.
Casting and forgings unworked do	76	63	France 12; West Germany 7; Nigeria 5.
Lead:			
Ore and concentrate	7,525	13,369	Austria 5,855; Spain 4,988; Greece 2,308.
Metal including alloys:			
Scrap	2,778	3,360	Belgium-Luxembourg 3,100; United Kingdom 214.
Unwrought	18	345	Netherlands 205.
Semimanufactures	707	140	Mainly to France.
Magnesium metal including alloys:			
Scrap	--	75	United Kingdom 36; United States 35; West Germany 4.
Unwrought	4,932	3,815	West Germany 2,915; Belgium-Luxembourg 423.
Semimanufactures	113	135	West Germany 69; France 35.
Manganese:			
Ore and concentrate	20	5	Mainly to Uganda.
Metal, all forms	--	15	West Germany 10; Netherlands 5.
Mercury 76-pound flasks	34,056	15,490	East Germany 2,853; United Kingdom 2,141; Japan 1,492.
Nickel:			
Ore and concentrate	23	--	
Metal including alloys:			
Unwrought including alloys	153	167	West Germany 97; France 44.
Semimanufactures	705	632	Spain 143; France 138; West Germany 83.
Platinum-group metals and silver including alloys:			
Platinum group thousand troy ounces	33	64	Mainly to West Germany.
Silver do	607	804	Switzerland 643.
Selenium, elemental kilograms	1,120	183	United Kingdom 100; West Germany 20; Greece 10.
Silicon, elemental	7,693	6,256	West Germany 2,680; United Kingdom 1,482; Romania 400.
Tin metal, all forms long tons	321	397	France 134; Denmark 88; West Germany 40.
Titanium oxides	16,879	19,198	Poland 4,060; Hungary 2,543; West Germany 2,274; France 2,085.
Tungsten:			
Ore and concentrate	13	3	All to West Germany.
Metal including alloys, all forms	18	48	West Germany 31; Belgium-Luxembourg 9.
Zinc:			
Ore and concentrate	39,657	11,861	Yugoslavia 6,060; Austria 5,000.
Metal including alloys:			
Blue powder	1,121	1,864	Romania 923; Czechoslovakia 618; Switzerland 111.
Unwrought	848	1,993	Greece 1,198; Turkey 539; France 140.
Semimanufactures	297	269	Switzerland 51; U.S.S.R. 31; Iran 26.
Other:			
Ash and residue containing nonferrous metals thousand tons	100	127	Mainly to United Kingdom.
Metal including alloys, all forms	12	8	West Germany 4; United Kingdom 2.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, corundum, etc	321,665	316,628	United States 176,661; United Kingdom 45,520; Algeria 28,146.
Dust and powder of precious and semiprecious stones kilograms	728	62	Japan 30; West Germany 19; United States 5.
Grinding and polishing wheels and stones	5,087	6,363	France 1,501; West Germany 704; Romania 415.
Asbestos	46,075	48,662	West Germany 20,263; France 9,715; Netherlands 4,430; Poland 2,841.
Barite and witherite	52,592	53,722	United States 26,003; Netherlands 15,980.
Cement	159,197	130,301	Algeria 36,285; Libya 29,127; Yugoslavia 16,430; France 14,555.
Chalk	684	807	Switzerland 736; Yugoslavia 25; Greece 20.

See footnotes at end of table.

Table 2.—Italy: Exports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
NONMETALS—Continued			
Clays and products (including nonclay bricks):			
Crude n.e.s.:			
Bentonite	15,687	13,003	Libya 5,887; France 1,799; West Germany 1,086.
Kaolin	599	1,679	Greece 1,142; Iran 356; Belgium-Luxembourg 50.
Other	33,133	36,280	France 32,433; Greece 1,709.
Products:			
Refractory (including nonclay bricks)	40,725	56,524	West Germany 7,829; Switzerland 6,397; Yugoslavia 4,653; Spain 4,589.
Nonrefractory	561,425	741,652	Yugoslavia 193,136; France 130,602; West Germany 114,220.
Diamond:			
Gem not set or strung value, thousands	$224	$171	Venezuela $112; United States $32; Canada $27.
Industrial carats	r 30,000	15,000	West Germany 10,000; Switzerland 5,000.
Diatomite and other infusorial earths	1,976	1,499	Cuba 306; Austria 225; Switzerland 129.
Feldspar	27,401	25,890	West Germany 10,422; Netherlands 2,875; Switzerland 2,605.
Fertilizer:			
Crude	r 508	1,620	France 1,396.
Manufactured:[2]			
Nitrogenous thousand tons	841	697	People's Republic of China 241; Turkey 144; Arab Republic of Egypt 116.
Phosphatic do	7	8	Kenya 3; Libya 2; Switzerland 1.
Potassic do	127	46	Cuba 12; United States 8; France 7.
Other do	479	398	Cuba 79; Turkey 78; Kenya 21; Zambia 21.
Ammonia	26,895	33,218	Greece 12,742; Israel 12,136; Lebanon 6,071.
Fluorspar	106,977	116,539	United States 91,676; India 7,950; Norway 6,709.
Graphite	1,532	1,815	France 1,295; Switzerland 141.
Gypsum and plaster	30,897	34,211	Yugoslavia 19,611; Switzerland 9,767; France 1,558.
Kyanite	39	533	West Germany 509; France 22.
Lime	70,541	49,700	Libya 30,737.
Magnesite	125	58	Iran 25; Spain 20.
Mica:			
Crude including splittings and waste	r 724	439	Libya 210; France 127.
Worked including agglomerated splittings	29	41	West Germany 21; Yugoslavia 9.
Precious and semprecious stones, except diamond:			
Natural kilograms	734	54	Japan 29; West Germany 19.
Manufactured do	899	455	Switzerland 274; France 29; Poland 26; West Germany 24.
Pyrite (gross weight)	40,272	19,386	Switzerland 17,548; Austria 798; West Germany 584.
Salt, all forms	29,387	226,600	Netherlands 116,697; United Kingdom 49,050; Norway 40,077.
Sodium compounds n.e.s	180,442	230,510	U.S.S.R. 48,615; Brazil 19,125; Greece 16,936.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous	277,613	273,611	West Germany 58,885; France 43,406; Belgium-Luxembourg 18,200.
Slate	4,501	4,951	Switzerland 2,506; West Germany 861; Belgium-Luxembourg 579.
Other	44,100	40,451	Switzerland 13,358; West Germany 13,017; Austria 6,355.
Worked, all forms	481,371	519,996	West Germany 244,965; France 108,622; United States 71,710.
Dolomite, all grades	19,075	20,259	Switzerland 6,943; Austria 2,894; Yugoslavia 2,490.
Gravel and crushed rock	460,436	441,187	West Germany 120,285; Switzerland 78,427; Libya 41,117.
Limestone (except dimension)	1,162	3,420	Switzerland 3,213; Sweden 66.
Quartz and quartzite	34,355	39,948	Switzerland 22,097; West Germany 11,998.
Sand excluding metal bearing	265,141	401,009	Switzerland 358,187; France 17,652.
Sulfur:			
Elemental, all forms	6,737	5,971	Mainly to Yugoslavia.
Sulfuric acid	114,229	83,828	Turkey 42,184; Israel 36,039; Spain 1,843.
Talc, steatite, and soapstone	50,221	55,516	West Germany 13,303; United States 13,208; United Kingdom 6,798.

See footnotes at end of table.

Table 2.—Italy: Exports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	393	1,573	United Kingdom 691; Tunisia 401; Malta 263.
Carbon black	27,879	40,392	Austria 6,491; Turkey 4,855; Poland 4,224; Iran 3,285.
Coal excluding briquets, all grades	r 3,841	8,856	Romania 3,718; Portugal 2,000; Bahrain 773.
Coke and semicoke	346,476	379,911	Romania 121,374; Yugoslavia 69,014; Austria 49,236; France 43,738.
Petroleum refinery products:			
Gasoline..thousand 42-gallon barrels	49,122	50,354	United Kingdom 11,739; Belgium-Luxembourg 6,911.
Kerosine and jet fuel do	18,771	21,243	United States 2,379; Greece 2,162; Netherlands 1,922.
Distillate fuel oil do	76,928	76,778	France 16,121; West Germany 15,099; Netherlands 11,996; Switzerland 8,967.
Residual fuel oil do	77,909	85,121	United States 27,652; United Kingdom 5,921.
Liquefied petroleum gases do	3,636	3,561	Arab Republic of Egypt 812; France 580; Turkey 487.
Lubricants do	1,733	1,733	Switzerland 294; Belgium-Luxembourg 189; Yugoslavia 91.
Bitumen and other do	226	132	Libya 77; Tunisia 19.
Mineral jelly and wax do	13	16	Republic of South Africa 6; West Germany 1.
Other do	1,973	1,869	Austria 693; Switzerland 406; Yugoslavia 196; Libya 168.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	11,764	15,712	Yugoslavia 4,971; Greece 2,969; United Kingdom 2,266.

r Revised. NA Not available.

[1] Less than 1 ton.

[2] Erroneously reported in tons in 1969.

Source: Statistica Annuale Del Commercio Con l'Estero. V. II, 1969 and 1970. World Trade Annual. V. I-III, 1969-70.

Table 3.—Italy: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum:			
Bauxite	590,198	723,785	Yugoslavia 300,042; Sierra Leone 128,572; Guinea 99,123.
Oxide and hydroxide	72,933	71,767	Greece 38,295; France 21,313; United States 4,522.
Metal including alloys:			
Scrap	31,695	36,568	France 10,785; United States 9,352; West Germany 5,626; Hungary 3,091.
Unwrought	156,551	166,955	France 34,862; Greece 19,490; Surinam 19,046; United States 16,650.
Semimanufactures	29,594	37,397	West Germany 10,099; Greece 5,846; Austria 3,071.
Antimony:			
Ore and concentrate	659	971	Morocco 615;Mexico 175; Thailand 81.
Metal including alloys, all forms	329	166	Belgium-Luxembourg 124; West Germany 25.
Arsenic:			
Natural sulfides	20	NA	
Trioxide, pentoxide and acids	186	NA	
Metal including alloys, all forms	101	78	Sweden 60; United States 6; Canada 6.
Beryllium:			
Oxide kilograms	3,000	2,000	Norway 1,000; France 1,000.
Metal including alloys, all forms do	2,362	3,101	Switzerland 1,247; West Germany 1,129.
Bismuth metal including alloys, all forms	115	181	United Kingdom 68; France 25; West Germany 4.
Cadmium	37	40	Netherlands 10; Republic of South Africa 7; France 6.
Chromium:			
Chromite	160,456	142,762	Albania 36,243; U.S.S.R. 32,882; Republic of South Africa 31,419.
Oxide and hydroxide	450	321	West Germany 139; Poland 101.
Metal including alloys, all forms	74	113	France 80; United States 15; United Kingdom 9.

See footnotes at end of table.

Table 3.—Italy: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS—Continued			
Cobalt:			
Oxide and hydroxide	314	299	Belgium-Luxembourg 227; France 4.
Metals including alloys, all forms	458	337	Belgium-Luxembourg 248; United States 24.
Copper:			
Ore and concentrate	6	NA	
Matte	1,345	1,106	United States 242; Albania 189; Zambia 157.
Metal including alloys:			
Scrap	46,152	47,512	West Germany 13,796; France 11,910; United States 9,036; Switzerland 1,893.
Unwrought	264,517	295,238	Zambia 75,009; Chile 61,037; United States 35,657.
Semimanufactures	12,275	16,483	West Germany 6,535; Yugoslavia 2,817; Switzerland 1,229; United States 673.
Gallium, indium, and thallium kilograms	7,882	662	West Germany 224; United States 161; United Kingdom 133.
Germanium do	3,033	5,867	Belgium-Luxembourg 4,359; Spain 585; United Kingdom 336.
Iron and steel:			
Ore and concentrate thousand tons	11,037	10,856	Liberia 2,855; Canada 1,361; Brazil 1,146; Venezuela 1,112.
Roasted pyrites do	[r]6	1	All from Turkey.
Metal:			
Scrap do	5,135	5,156	France 2,036; West Germany 1,778; United Kingdom 517.
Pig iron including cast iron and speigeleisen do	805	929	West Germany 329; Algeria 202; U.S.S.R. 83.
Sponge iron, powder and shot do	14	24	Canada 9; France 8; Sweden 4.
Ferroalloys:			
Ferromanganese do	113	129	France 58; Belgium-Luxembourg 17.
Other do	97	76	France 25; Norway 7; Yugoslavia 7.
Steel, primary forms do	629	860	United States 306; France 235; West Germany 116; Belgium-Luxembourg 44; Republic of South Africa 26.
Semimanufactures:			
Bars, rods, angles, shapes, and sections do	575	760	West Germany 169; France 168; Belgium-Luxembourg 166.
Universals, plates, and sheets do	1,351	1,464	France 294; West Germany 266; Belgium-Luxembourg 218; Japan 200.
Hoop and strip do	125	112	France 31; West Germany 30; Belgium-Luxembourg 22.
Rails and accessories do	118	110	France 60; West Germany 22; Belgium-Luxembourg 11.
Wire do	40	56	Belgium-Luxembourg 20; Yugoslavia 9; West Germany 8; France 5.
Tubes, pipes, and fittings do	150	228	West Germany 96; France 47; Yugoslavia 20.
Castings and forgings do	22	29	West Germany 13; France 6.
Lead:			
Ore and concentrate	30,951	31,934	Canada 9,410; Ireland 7,014; Morocco 5,773; Greece 4,390.
Ash and residue containing lead	5,171	7,027	Yugoslavia 2,622; Sweden 995; Australia 797; West Germany 647.
Metal including alloys:			
Scrap	20,210	37,076	France 17,773; West Germany 7,655; Switzerland 6,126.
Unwrought	65,183	121,056	West Germany 24,611; Mexico 21,256; Republic of South Africa 20,625; Belgium-Luxembourg 10,610.
Semimanufactures	1,722	767	France 298; Yugoslavia 264; West Germany 196.
Magnesium metal including alloys:			
Scrap	1,244	648	West Germany 515; France 56; Yugoslavia 25.
Unwrought	509	410	United States 318; West Germany 44.
Semimanufactures	20	70	West Germany 31.

See footnotes at end of table.

Table 3.—Italy: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS—Continued			
Manganese:			
Ore and concentrate	160,592	184,385	Republic of South Africa 53,230; Ivory Coast 34,950; Brazil 29,578; Gabon 21,910.
Oxides	1,694	2,803	Japan 2,462; Belgium-Luxembourg 246.
Metal, all forms	2,039	1,855	France 1,210; Republic of South Africa 299.
Mercury 76-pound flasks	638	4,989	Yugoslavia 2,379; Mexico 1,682.
Molybdenum:			
Ore and concentrate	r 3,406	4,648	United States 2,141; Netherlands 1,391; Canada 661.
Metal including alloys, all forms	46	48	Austria 30.
Nickel:			
Ore and concentrate	295	--	
Matte, speiss, and similar materials	4,553	5,185	Canada 2,620; Cuba 2,249; Netherlands 194.
Metal including alloys:			
Scrap	531	430	Switzerland 105; United States 94; Belgium-Luxembourg 61.
Unwrought	10,765	12,798	Canada 4,582; United Kingdom 1,992; Norway 1,820.
Semimanufactures	2,605	2,847	West Germany 693; United Kingdom 637; United States 562.
Platinum-group metals and silver:			
Metals including alloys:			
Platinum group thousand troy ounces	109	127	United Kingdom 74; United States 14; West Germany 12.
Silver do	32,822	43,709	Oman 14,576; West Germany 9,590; United Kingdom 7,861; United States 3,635.
Selenium, elemental	34	18	United States 9; West Germany 4; Japan 2.
Silicon, elemental	840	542	Yugoslavia 284; United States 103; West Germany 76; France 61.
Tin:			
Metal including alloys:			
Scrap long tons	19	47	Brazil 10; Belgium-Luxembourg 10; Greece 6.
Unwrought do	7,458	7,395	Malaysia 5,891; Thailand 704; Belgium-Luxembourg 305.
Semimanufactures do	101	103	West Germany 60; Belgium-Luxembourg 6.
Tantalum metal	6	6	Belgium-Luxembourg 2; United States 2; West Germany 1.
Titanium:			
Ore and concentrate	96,323	107,519	Norway 95,395; Australia 6,536; U.S.S.R. 5,101.
Oxides	29,773	33,103	West Germany 16,085; France 6,481; Netherlands 4,239; United Kingdom 2,432.
Metal including alloys, all forms	676	899	United States 531; West Germany 124; France 85.
Ore and concentrate	61	138	Canada 33; Brazil 30; Bolivia 20.
Metal including alloys, all forms	59	67	United States 15; France 14; West Germany 11.
Uranium and thorium metal kilograms	r 730	42,953	United Kingdom 41,599; United States 1,354.
Zinc:			
Ore and concentrate	60,241	103,563	Peru 22,711; Ireland 19,920; Algeria 13,533; Tunisia 13,277; Greece 10,526.
Ash and residue containing zinc	9,821	10,463	Switzerland 4,117; Germany 3,226.
Metal including alloys:			
Scrap	5,981	3,758	West Germany 1,442; France 1,161.
Blue powder	3,474	3,746	Belgium-Luxembourg 3,183.
Unwrought	45,811	56,289	West Germany 19,254; Yugoslavia 8,865; Belgium-Luxembourg 7,187; Canada 6,273.
Semimanufactures	2,999	3,782	Belgium-Luxembourg 2,626; West Germany 384.
Zirconium:			
Ore and concentrate	18,383	35,290	Australia 34,648; United Kingdom 269; West Germany 262.
Oxides	560	550	West Germany 409; United Kingdom 89; United States 44.
Metal including alloys, all forms kilograms	4,655	7,293	United States 2,814; United Kingdom 2,762; Canada 834.

See footnotes at end of table.

Table 3.—Italy: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS—Continued			
Other:			
Ore and concentrate	4,272	6,131	United States 2,141; Netherlands 1,481; Canada 661.
Ash and residue containing nonferrous metals ....kilograms..	580	579	Romania 321; United Kingdom 177; France 29.
Base metals including alloys	3,780	3,654	France 1,433; United States 654; Belgium-Luxembourg 398.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, etc	3,522	2,805	West Germany 1,529; United States 181.
Dust and powder of precious and semiprecious stones value, thousands..	$3,351	$3,656	Zaire $882; Switzerland $753; Netherlands $638; United States $539.
Grinding and polishing wheels and stones	4,233	4,587	West Germany 1,108; Austria 1,028; United Kingdom 761.
Asbestos	58,229	62,402	Republic of South Africa 33,575; Canada 16,686; U.S.S.R. 10,089.
Barite and witherite	5,838	24,772	People's Republic of China 9,002; Spain 5,000; France 4,977.
Borates, crude, natural	96,388	126,667	Turkey 108,723; West Germany 4,345.
Cement	476,622	216,629	France 118,211; Greece 27,516; Tunisia 22,677.
Chalk	7,794	7,532	France 6,390; Austria 1,024.
Clays and products:			
Clays:			
Bentonite	9,975	14,528	Greece 10,334; United States 3,368.
Kaolin	487,669	562,457	United Kingdom 299,269; United States 149,367.
Other	679,330	792,357	France 290,846; West Germany 252,472.
Products:			
Refractory (including nonclay bricks)	80,610	119,937	West Germany 46,503; France 17,387; Austria 15,672.
Nonrefractory	16,162	20,148	West Germany 15,708; Switzerland 3,031.
Cryolite and chiolite	732	639	All from Denmark.
Diamond:			
Gem not set or strung value, thousands..	$2,616	$1,981	Belgium-Luxembourg $1,470; Netherlands $369.
Industrial ....kilograms..	8	2	United States 1; Israel 1.
Feldspar	14,671	19,270	Portugal 6,380; West Germany 4,134; Republic of South Africa 3,027.
Fertilizer materials:			
Crude:			
Nitrogenous	40	--	
Phosphatic.....thousand tons..	1,896	2,102	Morocco 562; Israel 118; Tunisia 59.
Potassic	47,774	44,963	France 33,423; East Germany 5,937; West Germany 5,523.
Manufactured:			
Nitrogenous	20,412	73,253	United States 26,709; Netherlands 15,638; France 6,248.
Phosphatic	179,569	255,114	Belgium-Luxembourg 58,710; France 54,113; Tunisia 46,384.
Potassic	232,526	283,939	France 79,040; West Germany 61,528; East Germany 38,684; Israel 34,836; U.S.S.R. 31,865.
Other	82,293	150,369	United States 46,964; Greece 29,367; West Germany 11,584.
Fluorspar	29,402	59,816	Algeria 17,439; France 13,321; Mexico 10,160; Tunisia 9,352.
Graphite	14,012	14,041	Austria 9,380; West Germany 2,585; Switzerland 568.
Gypsum and plasters	1,798	1,736	United States 812; West Germany 736.
Lime	938	368	Republic of South Africa 182.
Magnesite	48,305	55,677	Yugoslavia 18,013; Greece 12,500; Austria 7,503.
Mica:			
Crude including splittings and waste	2,556	1,503	Republic of South Africa 297; United Kingdom 273; India 221; Argentina 151; Norway 147.
Worked including agglomerated splittings	230	214	Belgium-Luxembourg 71; France 51; Czechoslovakia 32.

See footnotes at end of table.

Table 3.—Italy: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
NONMETALS—Continued			
Pigments, mineral, iron oxides	12,743	14,554	West Germany 9,945; France 2,419; Spain 934.
Precious and semiprecious stones, except diamond:			
Natural .... value, thousands	$1,020	$773	West Germany $188; Thailand $99; Belgium-Luxembourg $83; France $76.
Manufactured .... do	$1,176	$1,236	Switzerland $882; France $249.
Pyrite, gross weight .... thousand tons	857	846	U.S.S.R. 547; Cyprus 247; Turkey 32.
Salt	3,183	7,525	West Germany 5,041; United Kingdom 1,323.
Sodium and potassium compounds	22,275	15,092	France 13,023.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous including marble	167,637	178,625	Portugal 57,612; Yugoslavia 52,693; Iran 14,851.
Slate	3,186	3,859	West Germany 2,438.
Other	100,042	90,931	Republic of South Africa 24,685; Norway 13,820; Sweden 10,077.
Worked, all types	1,616	2,171	West Germany 521; Norway 412; France 342.
Dolomite	1,485	1,243	France 998; Switzerland 120.
Gravel and crushed rock	12,235	19,147	France 10,387; West Germany 2,114.
Quartz and quartzite	96,114	78,635	Portugal 36,764; Switzerland 25,112; West Germany 12,705.
Sand excluding metal bearing	1,020,059	1,169,704	Belgium-Luxembourg 567,428; France 472,977; West Germany 43,492.
Sulfur:			
Elemental, all forms	207,928	298,737	France 65,875; Canada 65,715; Poland 10,157.
Sulfur dioxide	2,360	1,044	West Germany 659; Spain 191; Turkey 145.
Sulfuric acid	14,612	26,945	Yugoslavia 19,651; Poland 4,274; Greece 2,463.
Talc, steatite, soapstone and pyrophyllite	17,870	17,983	Austria 10,545; France 2,874; Belgium-Luxembourg 1,026.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen	2,663	2,729	United States 2,660.
Carbon black	23,856	26,135	France 8,381; United States 6,056; United Kingdom 4,236; Netherlands 3,140.
Coal briquets:			
Anthracite and bituminous .... thousand tons	11,406	11,773	United States 3,934; West Germany 2,648; Poland 2,340; U.S.S.R. 1,811.
Briquets of bituminous and anthracite .... do	78	56	France 37; West Germany 16; Netherlands 2.
Lignite and lignite briquets .... do	236	234	West Germany 128; Yugoslavia 70; East Germany 32.
Coke and semicoke .... do	203	164	United States 67; France 42; Canada 33.
Peat including briquets .... do	15	32	West Germany 11; Syrian Arab Republic 9; Sweden 2; Romania 2.
Petroleum:			
Crude and partly refined .... thousand 42-gallon barrels	758,813	766,551	Libya 230,954; Iraq 162,490; Saudi Arabia 103,782; Kuwait 98,032.
Refinery products:			
Gasoline .... do	867	360	Netherlands 77; Libya 67; United States 50.
Kerosine and jet fuel .... do	597	254	U.S.S.R. 64; Libya 53; Greece 29.
Distillate fuel oil .... do	1,638	4,146	U.S.S.R. 1,958; Yugoslavia 817; Spain 479.
Residual fuel oil .... do	20,846	14,126	U.S.S.R. 5,230; Romania 1,203; Yugoslavia 936; Spain 868.
Lubricants .... do	898	1,046	United States 378; France 158; West Germany 152; United Kingdom 122.

See footnotes at end of table.

Table 3.—Italy: **Imports of mineral commodities—Continued**
(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Refinery products—Continued			
Other:			
Mineral jelly and wax thousand 42-gallon barrels	365	390	West Germany 128; United States 81; U.S.S.R. 51.
Petroleum, coke and pitch coke do	1,910	2,310	United States 1,578; U.S.S.R. 298; West Germany 247.
Bitumen do	1,451	1,652	United States 1,206; Albania 400; Netherlands 39.
Liquefied petroleum gases do	[r] 565	807	Yugoslavia 227; France 194; West Germany 164.
Unspecified do	17	19	France 8; West Germany 4.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	46,829	50,338	Czechoslovakia 17,416; U.S.S.R. 8,724; West Germany 5,046; Yugoslavia 2,979.

[r] Revised. NA Not available.

Source: Statistica Annuale Del Commercio Con L'Estero. V. II, 1969 and 1970. World Trade Annual. V. I, II, III, 1969 and 1970.

COMMODITY REVIEW

METALS

Aluminum.—Production of primary aluminum decreased 10,331 tons in 1971 and was more than 7 percent below that of 1970. Fifty-eight percent of the output came from plants operated by Montecatini Edison S.p.A. (Montedison) at Bolzano, Mori, and Venice-Fusina, and 39 percent from Societa Aluminio Veneto per Azioni (SAVA) at Fusina and Porto Marghera. The remaining 3 percent was produced by Alcan Alluminio Italiano, a subsidiary of the Canadian firm, Aluminium Ltd., at its plant in Borgo Franco.

Domestic production of bauxite declined over 15 percent from 1970 figures. The decline was due to mining lower grade ore at the Palmarizzi and Poggiardi mines near Lecce and to reduced production from residual vein deposits at the S. Giovanni Rotondo mine in Sardinia. Italy imported over one-half million tons of bauxite in 1971, principally from Yugoslavia, Guinea, and Sierra Leone.

After increasing at an average annual rate of nearly 11 percent for the 1966–70 period, consumption of aluminum dropped to 280,000 tons in 1971, or 9 percent below that of 1970. The demand for aluminum declined because of generally depressed economic conditions. The automobile manufacturing industry consumed 112,000 tons, construction, furniture, and appliance industries, 84,000 tons, packing and electrical industries 28,000 tons, and the remaining 56,000 tons was for other sectors of the economy.

The new Venice-Fusina smelter of Montedison operated for about 6 months and produced over 17,000 tons of primary aluminum. Full capacity was not reached because of delay in the startup of a potline due to labor problems and a decline in demand for aluminum.

Alluminio Sardo (ALSAR) in a joint venture with Ente Partecipazioni e Finanziamento Industria Manufatturiera (EFIM) and Montedison, was building an aluminum smelter near Porto Vesme, Sardinia. Completion is scheduled for early 1973. The facility will produce at a rate of 80,000 to 100,000 tons of primary aluminum annually, later to be increased to 150,000 tons annually.

A joint venture between the private sector (Montedison) and two state corporations, EFIM and Ente Nazionale Idrocarburi (ENI), was formed to build a primary aluminum and electrochemical complex near Mazara del Vallo, Sicily. The facility was expected to produce 100,000 to 150,000 tons of primary aluminum, 30,000 tons of primary magnesium, and 30,000 tons of phosphorus. An estimated $578 million will be invested in the plant. Employment would be provided to approximately 4,000 workers. A 600 to 700-million-kilowatt nuclear and conventional steam powerplant would be constructed to supply electricity for the facility. Completion of the electrochemical complex was scheduled for late 1977.

In 1971, Italy imported nearly one-half of its primary aluminum metal requirements. However, when current expansion in production capacity is completed, the nation's imports are expected to be drastically reduced and/or completely eliminated.

Antimony.—Output of antimony metal decreased 124 tons in 1971 and was 10 percent lower than in 1970.

The construction of an antimony smelter by Azienda Minerali Metallici Italiane S.p.A. (AMMI) near Marciano was completed and the smelter began processing stibnite ore from nearby mines. Capacity of the facility was reported at 3,000 tons annually. The smelter was designed to utilize the latest technology and equipment available. The selling price for antimony metal was expected to be competitive with that listed on the London exchange.

Copper.—Output of copper concentrate totaled 1,540 tons of contained metal, a drop of over 27 percent from that produced in 1970. Lower production was due to declining ore grade at the Torrento Otro mine near Vercelli and closing of the Predoi mine near Alto Adige.

The construction of a copper smelter near Aussa-Corno, northern Italy, was scheduled for completion at yearend 1975. The designed capacity of the facility was reported at 60,000 tons of refined copper annually. Imported copper concentrate will represent the bulk of the material processed by the smelter.

An intensive search for copper ores was reported in Sardinia. The area under investigation consisted of 37,500 acres in the south-central part of the island.

Titan Exploration Ltd. of Canada was contracted by AMMI to export 40,000 tons annually of copper concentrate for a period of 15 years to the copper smelter under construction at Aussa-Corno.

Iron and Steel.—The Italian iron and steel industry is the third largest among the countries in the European Coal and Steel Community (ECSC) and the fourth largest in Western Europe. Output of raw steel in 1971 was slightly higher than in 1970 and accounted for nearly 17 percent of ECSC steel production. Electric furnaces were the main source of steel (7.1 million tons), while Linz-Donewitz (LD) converters yielded 6.4 million tons. Open-hearth furnaces produced about 4.0 million tons.

At yearend, steel production capacity was reported at 22.9 million tons, an increase of 1.6 million tons over 1970. The iron and steel industry was operated at about 76 percent of its theoretical capacity.

Steel consumption totaled about 17.8 million tons, a 12 percent decline. The drop in steel consumption reflected a slump in consumer durables, residential, commercial, and shipbuilding construction, and reduced automobile sales. Italy was both an exporter and importer of steel. The 1971 steel imports were over 5.0 million tons, while exports totaled 4.1 million tons.

Per capita steel consumption in Italy was 330 kilograms in 1971 compared with 378 kilograms in 1970 and an average of 500 kilograms for European Economic Community (EEC) countries.

The Piombino steel facility (Acciaierie di Piombino) was installing an LD converter to increase production capacity to 1.8 million tons annually. Fiat and Italsider S.p.A., 50–50 joint owner of Piombino, were diversifying and expanding production lines to include rolling flat steel products for the former's use in automobile manufacturing.

Siderurgica Monfalcone, a privately owned plant, commenced production of steel with two electric furnaces late in 1971. The 120,000-ton-capacity facility will be expanded to 500,000 tons by the addition of four new electric furnaces within the next 2 years.

Acciaierie e Ferriere Lomborde Falck started operation of a continuous steel pouring unit having a capacity of 150 tons of molten steel. The system is "continuous-continuous"; hence, production of one long bram with steel coming from consecutive pourings of two electric furnaces.

Nippon Steel Ltd. of Japan contracted to provide managerial service at the Taranto steel complex operated by Italsider S.p.A., an affiliate of Finsider. Improvements in production, maintenance, and organizational knowledge was expected to increase steel output at the facility from 5 to 10 million tons annually over a 4-year period. Italsider operates most of the nation's integrated steel plants and accounts for 46 percent of the nation's production. At the Taranto plant, construction of a new LD section was commenced. Also, a unit for the continuous pouring of billets having a capacity of 500,000 tons annually, new rolling units, and two units for manufacturing welded tubes and pipes was being installed. The fourth blast furnace became operational during the year and construction started on the fifth. At completion of the current expansion phase, Taranto was expected to be the largest and most modern steel complex in Western Europe.

Italy's fifth steel center, costing $1.5 billion, will be located at Gioia Tauro, in the province of Calabria. The facility will be designed to produce from 5 to 10 million tons of steel with minimum air and water pollution. Italsider will maintain operational control of the complex. It currently operates steel centers in Taranto, Genoa, Naples, and Piombino. Anticipated employment was expected to total about 7,500 workers.

Iron Ore.—Domestic output of iron ore declined nearly 10 percent from that mined in 1970. Italy's production of iron ore continued to drop because of high costs and low grade. The grade of the iron ore mined declined from 45 percent in 1970 to 42 percent in 1971.

The nation imports most of its iron ore requirements. In 1971, 11.2 million tons were received from Liberia, Australia, Venezuela, Canada, Brazil, and three other countries. Liberia supplied over 25 percent of the imports.

Pig Iron.—The production of pig iron rose from 8.4 to 8.6 million tons in 1971, an increase of over 2 percent. Blast furnaces were the principal sources of pig iron, accounting for 8.4 million tons. The remaining 0.2 million tons were from electric furnaces. Italsider remained the largest producer of pig iron in Italy, accounting for over 87 percent of output. Imports of pig iron from four countries totaled nearly 1 million tons, with West Germany supplying over 30 percent of the total imports.

Iron and Steel Scrap.—The 1971 consumption of iron and steel scrap in steelmaking totaled 11.7 million tons. Approximately 38 percent of the scrap supply originated within the industry, 18 percent derived from home markets, and the remaining 44 percent came from foreign countries. Iron and steel scrap was imported principally from France and West Germany. The iron and steel scrap consumption and distribution by source, for the last 2 years was as follows:

	Quantity (thousand metric tons)	
	1970	1971
Domestic supply:		
Own arising	4,280	4,386
Home supplies	[r] 2,365	2,080
Imports:		
From ECSC countries	[r] 3,812	3,596
From other countries	[r] 1,332	1,619
Total	[r] 11,789	11,681
Yearend stock	1,155	1,050

[r] Revised.

Special Steels.—Production of all types of special steels declined 121,000 tons in 1971 and was nearly 4 percent lower than in 1970. The nation's output of carbon and alloy steel in the last 2 years was as follows:

	Quantity (thousand metric tons)	
	1970	1971
High-carbon steel:		
Structural	1,286	1,309
Tool	2	2
Total	1,288	1,311
Alloy steel:		
Structural	1,057	938
Tool	29	26
Bearing	107	107
Stainless	245	224
High speed	1	1
Others	3	2
Total	1,442	1,298
Grand total	2,730	2,609

Lead and Zinc.—Output of both lead and zinc, metal content, decreased; the former 10 percent, the latter 4 percent, compared with 1970 totals. Production declines in both metals were reportedly due to increased labor costs, decreasing grade of minable ores, and removal of protective tariff on domestic production. Virtually all lead and zinc was mined in Sardinia.

A state agency, Societa Richerche Gestione e Ristrutturazione Miniere Sarda (SOGERSA) was established to operate lead and zinc mines in Sardinia. Mines affected would include those operated by Piombo-Zincifera Sarda, AMMI Sarda, and Societa Richerche Minerarie Sarda (RIMISA). The Italian Senate was critical of AMMI's investments in lead, zinc, and antimony mining, and also in the accuracy of its balance sheets. An extensive exploration program for lead and zinc was reportedly conducted in the Inglesias area of Sardinia.

Completion of AMMI's lead and zinc smelter at Porto Vesme was delayed because of technical difficulties. The facility, employing Imperial Smelting Corp.'s pyrometallurgical process, was rescheduled for completion to yearend 1972. Designed capacity was reportedly totaling 100,000 tons, of which 60,000 tons was for zinc, the remaining 40,000 tons for lead. In addition, a total of 105,000 tons of sulfuric acid will be recovered annually from metallurgical gases produced.

AMMI announced completion of a zinc roaster at Porto Vesme, Sardinia. The facility was designed to have throughput of 300,000 tons annually and will be operated on ores averaging 6 to 8 percent metal content. Bipromet of Katowica, a mineral engineering firm from Poland, was the prime contractor on the $2 million project. The plant was constructed in less than 2 years; all major equipment was of Polish manufacture.

Manganese.—Italy was the only country within the EEC to mine manganese ore exceeding 20 percent in grade. Output, however, dropped to 30,604 tons in 1971 from the 50,091 tons mined in 1970. Manganese ore was mined at Ferromin's Gambatesa mining facility, north of La Spezia.

Mercury.—The 1971 mercury price on both the New York and London exchange continued downward as world demand for the metal declined. Output of cinnabar ores rose slightly but the grade was lower. Metal production decreased 4 percent to 42,613 76-pound flasks. The drop in metal production was due to the decreasing use in the chemical industry. Exploration activity was restricted to existing mines to replace current production.

Italian exports of mercury decreased by 260 flasks in 1971 and was nearly 2 percent below that of 1970. East Germany was the leading importing country with 3,626 flasks, a drop of 10 percent compared with the 1970 total. Exports to the United States dropped 50 percent.

At yearend, mercury metal in stocks totaled over 43,512 flasks and was equal to 1 year's production.

At yearend, Stabilimento Minerario del Siele curtailed mercury production at the Santa Fiora facility, east of Grosseto. Modernizing of surface mining facilities continued at Abbadia San Salvatore to reduce cost of exploiting low grade ore.

NONMETALS

Asbestos.—The output of asbestos increased over that produced in 1970. Most of Italy's asbestos came from the San Vittore open pit mine operated by Societa Amiantifera di Balangero, near Turin. Italy exported 48,793 tons of short fiber asbestos and asbestos powder. West Germany received over 40 percent of total exports. Other countries receiving Italian asbestos were France, the Netherlands, Poland, and Spain.

Barite.—Output of ground barite decreased 21,535 tons in 1971 and was 10 percent lower than in 1970. A drop in exports and domestic requirements by the chemical industry accounted for lower output. Italy exported 34,968 tons in 1971 compared with 53,722 tons shipped in 1970.

Laviosa S.p.A. was expanding barite and bentonite production facilities near San Antioco, Sardinia. The designed capacity of the plants was reported at over 60,000 tons annually of micronized barite and about 200,000 tons annually of bentonite.

AMMI was taking over the barium compounds production facilities of Fabbrica Sali di Bario near Calolzio Corte, northern Italy. Also, the agency announced plans for construction of a plant on the Island of Sardinia for processing barite to barium chemicals. Previously, Sardinia's output of barite was shipped to the mainland and processed to a marketable product for use by the local chemical industry and for export.

Cement.—Cement output totaled 31.7 million tons, a decline of over 4 percent from 1970 figures. Reduced demand for cement in commercial and industrial construction was reflected in lower production for 1971. Italy's cement industry continued to rank second to West Germany among West European countries. The industry comprises 120 plants, of which one-half are in northern Italy.

Cementerie del Tirreno S.p.A. (Cementir), a state-controlled company and affiliate of ENI, was expanding production capacity by enlarging cement plants in Taranto and Spoleto. The production capacity of cement at the Taranto plant would increase nearly 50 percent to 1.6 million tons, while Spoleto capacity will rise to 0.6 million tons. The company announced plans to construct a new cement plant at Madalloni having a capacity of 1.4 million tons. Cementir accounted for about 12 percent of Italy's production of cement.

The capacity of cement plants rose to 41.2 million tons in 1971, an increase of 4.6 million tons or nearly 13 percent compared with 1970. The industry operated at 77 percent capacity in 1971 compared with over 90 percent capacity in 1970.

A $2.1 million plant for the production of prestressed concrete pipe was scheduled for construction by Societa Appalti e Forniture per Acquedotti e Bonifiche S.p.A. (SAFAB) near San Severo. Other concrete products also will be manufactured.

In April the Inter-Ministerial Price Committee authorized an immediate cement price increase ranging from 5.5 to 6.7 percent, depending on quality and type of cement. This was the first increase in cement prices since 1960. Italy's cement prices remain the lowest in Western Europe.

Fertilizer Materials.—*Phosphates.*—Fosfitalia S.p.A. started construction of a plant to produce phosphoric acid and a range of phosphate compounds at Monfalcone, near Trieste. The facility, costing $5 million, will have a designed capacity of 250,000 tons annually. Sulfuric acid production for captive use will be included as part of the overall project. Startup was scheduled for 1973. Italy depends heavily on importation of phosphates for its needs. In 1971 imports totaled nearly 2 million tons, mostly from African countries.

Potassium Salts.—Production of potassium salts totaled nearly 1.8 million tons, 6 percent below 1970 output. Output came from mines operated by Montedison and AMMI near Palo, Racalmuto, Pasquasia, and Corvillo, Sicily. Montedison also operated a processing facility near Campofranco, Sicily. Virtually all the potassium ore production was processed into chemical fertilizers. The decline in output was attributed to a weakening in demand for potash fertilizers, especially in the export market. Expansion of existing mining and processing facilities in Sicily was continued. Potassium ore deposits were discovered in the Porto Empedocle area of Sicily. Employment in the industry was expected to increase to 1,000 workers by the mid-1970's from the 500 employed in 1971.

Fluorspar.—Output of fluorspar decreased from that produced in 1970. Italy's fluorspar industry was dominated by two companies, namely Montedison and Mineraria Silius S.p.A. The fluorspar mines in Sardinia accounted for most of the nation's output, although mines in northern Italy near Trento also were important producers.

Mineraria Silius S.p.A. continued with development of the Acqua Frida mine on an extension of the fluorspar deposit currently mined by Genna Tres Montis and Muscadroxiu Mines in Sardinia. In addition, the company operates two flotation plants and a pelletizing facility near Assemini, Sardinia.

Development of the Pianciano fluorspar deposit 25 miles northwest of Rome was commenced by Soricom S.p.A. The open pit mine and processing facility was reported to cost $5 million. Proven reserves were calculated at 8 million tons averaging 55 to 56 percent calcium fluoride. In addition, indicated reserves were estimated as substantial. Design capacity of the beneficiation and pelletizing plant was reported at 500,000 tons annually for the former and 200,000 tons annually for the latter. The facility would be operational in 1973.

Exports of fluorspar rose significantly to 155,023 tons, or 33 percent higher than the 1970 total.

Fluorsid was building a fluorine processing plant at Assemini, Sardinia. The facility will have a designed capacity of about 22,000 tons of dry fluorine and 42,000 tons of briquetes annually.

Ente Mineraria Sarda (EMS) discovered significant deposits of fluorspar and barite on the Island of Sardinia. Development of these deposits was assigned to subsidiary companies, namely Fluorsarda and Bariosarda. The latter planned to spend $11.2 million for a chemical plant to process 200,000 tons of barite annually.

Mineraria Silius S.p.A., Europe's largest producer of acid-grade fluorspar, acquired a 49 percent interest in Industrie Chimiche

Incg. Bonelli S.p.A. (ICIB). The chemical firm is a manufacturer of fluorine chemical products, including aluminium fluoride and synthetic cryolite.

Magnesium Compounds.—Sardamag S.p.A. was expanding production capacity of magnesium oxide at its San Antioco plant at a cost of $14 million. Increased demand for magnesium oxide was for use in refractories by the nation's iron and steel industry and for export. Seawater was used as feed material for the plant.

Perlite.—Perlite di Corsico was modernizing ore grinding and bulk loading facilities at the Brabau di Torregrande, Sardinia. The company operates perlite processing plants at Oristano and Uras and a mining facility at Monte Arci. Italy's only perlite deposit was developed 20 years ago in Sardinia. Output in 1971 approximated that produced in 1970.

Pyrite.—Italy produced slightly over 1.5 million tons of pyrite concentrate, about the same as in 1970. Montedison, the principle Italian producer, continued an active exploration program in the vicinity of its three mines, the Niccioleta, Gavorrano, and Bouccheggiano. Also, the company was doubling the production capacity of the Scarlino facility to 1.5 million tons of pyrite on the basis of last year's 25 million ton pyrite discovery.

Italy continued to rank second to Spain among Western European countries in the production of pyrite. Although domestic production of pyrite was high, Italy imported over one-third million tons in 1971.

Montedison announced plans to develop a large pyrite deposit in the Maremma area of Tuscany. Proven reserves were calculated at 25 million tons, sufficient to justify an economic operation for several years. Funds for the construction of a mining and processing facility were authorized, and start of operation was scheduled for 1973.

Salt.—The 1971 production of rock salt totaled 3.4 million tons, an increase of nearly 18 percent. Most of the increased output came from a mine near Realmonte.

EMS and a private firm owning several Sicilian salt mines agreed on a merger which would give EMS control of 90 percent of Sicily's rock salt production. Under terms of the merger, a new firm would be formed for operating purposes. Initial production of the new company was estimated at 1.2 million tons of rock salt annually, which was projected to increase to 3 million tons in 2 years. The Realmonte mine was expected to remain the largest producing operation. Most of the rock salt will be consumed to manufacture pure sodium chloride. At completion of the current expansion program, Sicily was expected to be Europe's major rock-salt-producing center.

Production of marine salt declined to 1.2 million tons in 1971. Montedison continued with development of a 140-million-ton salt deposit near Timpa del Salto. Sixteen wells were drilled into the salt deposit. The salt brine will be pumped via 35-mile pipeline to the Ciro Marina Works. Loading docks were built at Punta Alice on the Ionian Sea for shipping purposes.

Sand and Gravel.—*Silica Sand.*—Italsie was building a silica sand processing plant near Melfi, Potenza, having a designed capacity of 320,000 tons annually. Future production was contracted to the local glass industry, the Societa Italiana Vertro (SIV) glass plant near San Salvo. Other markets for the silica sand include foundry and abrasives. SIV will expand its glassworks near San Salvo to include a float glass unit. Technology of the float process was licensed from Pilkington Brothers, England.

The currently mined silica sand deposit, having reserves estimated at 36 million cubic meters, was discovered in the early 1960's.

ENI and EFIM acquired complete ownership in the glassmaking firm of SIV from Libby-Owens-Ford, Inc. The company was a leading producer of automotive and flat glass products in Italy. Under a new agreement, Libby-Owens-Ford will provide technical assistance to the company.

Pennitalia Securglass S.p.A. completed construction of a safety glass plant near Roccasecca. The company is an affiliate of Pittsburgh Plate Glass Co., of the United States.

Stone.—*Marble.*—Production of block marble (white and colored) decreased in 1971. A decline in Italy's building construction accounted for lower output of marble.

More than 80 types and/or grades of marble were produced in Italy, mostly from Tuscany. Numerous other varieties of metamorphic rock were quarried in many parts of the country.

Exports of marble in blocks, slabs, and finished pieces rose more than 11 percent compared with those of 1970.

Sulfur.—Output of sulfur ores increased significantly over that produced in 1970. Most of the increase in production came principally from a new strip-mining project near Pomezia. The sulfur ore came from the nation's 12 producing mines in Sicily and a strip-mine operation near Pomezia. Despite increased output, Sicily's mine production costs remain high, hence prices were not competitive with those of foreign sulfur. For example, sulfur produced in Sicily costs about $120 per ton compared with an international price of $32 per ton.

The EEC terminated an aid program to the Sicilian sulfur industry which provided financial help in modernizing mines to increase productivity and/or competitiveness. To assist sulfur miners in relocating to other areas for employment, a total of $4.2 million was provided by the agency. Sicilian sulfur mines employ over 3,400 workers. In the past 10 years subsidies totaling $30 million have been provided to the Sicilian sulfur operations.

Raw sulfur imports decreased 52,770 tons in 1971 and was nearly 18 percent below those of 1970.

MINERAL FUELS

Consumption of fuels in Italy was estimated at 108.7 million tons of standard coal equivalent.[3] Since the output of coal, crude oil, and natural gas production remain small, imports of solid and liquid fuels were a significant part of the nation's energy supply. Domestic resources provided an estimated 23 percent of the energy consumed while the remainder came from imports. The following tabulation shows the share of different sources of energy in tons of standard coal equivalents.

	1969	1970	1971
Solid fuels	9.6	9.4	9.1
Liquid fuels	69.8	r 73.7	77.5
Natural gas	9.8	10.7	10.9
Nuclear, geothermal, and hydroelectric power	11.5	r 12.0	11.2
Total	100.7	r 105.8	108.7

r Revised.

Coal.—Output of coal decreased over 39,000 tons in 1971, 13 percent below 1970 figures. The decline in production was due to high production and transportation costs. Despite expenditures of over $12 million during the past 5 years by the Ente per l'Energia Elettrica (ENEL) for mechanization of mines, coal production continued to decline in volume because of competition from liquid and gaseous energy sources.

Italy's only coal deposits located in the Sulcis Basin of Sardinia, are high in sulfur and ash. In addition, the very low thermal quality of about 5,000 to 5,500 calories per kilogram compares unfavorably with foreign coals averaging 6,000 to 7,500 calories per kilogram. The mining of these coal deposits was expected to be discontinued in 1972. Some 4,000 workers are dependent on employment on the Sulcis coal deposits and will be relocated to other job areas.

The entire production of Sulcis coal was utilized exclusively at the Porto Vesme thermoelectric power station. However, due to the deleterious elements and low calorie content, the use of Sulcis coal hinders the operation of the power complex and adds to its operating costs.

Coal continued to rank high on the list of Italian imports of mineral commodities. In 1971, over 12 million tons of coal was imported; over 63 percent came from the United States, the U.S.S.R., and Poland. Coking coal accounted for about 80 percent of coal imports, the remaining 20 percent was steam coal, anthracite, gas coal, and other solid fuels.

Coke.—The 1971 output of coke decreased 115,000 tons from the 7.3 million tons produced in 1970. Metallurgical coke accounted for 98 percent of the output, and the remaining was for gasworks. Italy's entire output of coke was produced from imported coking coal, principally from West Germany, the United States, and Poland. Yearend stocks rose from 130,000 tons in 1970 to 397,000 tons at the end of December 1971. Decline in output and subsequent increase in stocks was due to lower sales. Coke for heating markets dropped 40 percent from 1970 and the demand was lower for foundries and other metalworking markets.

Lignite.—Lignite mining was related to the activity of thermoelectric plants at the pithead of the principal domestic lignite coal fields of Valdarno and Pietrafitta. Output of lignite declined 5 percent from that produced in 1970. Electric power production continued to increase at plants utilizing fuel oil.

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[3] At 10,000 calories per kilogram.

Natural Gas.—The 1971 production of natural gas was nearly 13.4 billion cubic meters, an increase of nearly 2 percent compared with 1970 production. Increased output of natural gas came from the Po Valley gasfields, Adriatic and Ionian Sea gasfields, and those in southern Italy. Offshore gasfields accounted for about one-half of Italy's 1971 natural gas production compared with about 36 percent in 1970.

ENI was seeking an increase in price of natural gas from $22.10 to $28.05 per thousand cubic meters. Industrial users accounted for over one-half of the natural gas market. Other major consumers were residential and commercial establishments, 27 percent; electric power generating facilities, 16 percent; chemical processing, 2 percent; and 1 percent for other uses.

ENI discovered a natural gasfield in the Ionian Sea, near Crotone, Calabria. While large offshore oil and gasfields have been found in the Adriatic Sea, this was the first gas discovery in the Ionian Sea.

The 1971 natural gas discoveries added an estimated 16,000 million cubic meters (565,000 million cubic feet) to Italian gas reserves, exceeding the amount consumed in 1971. Domestic reserves are estimated over 178.0 billion cubic meters.

Italy consumed about 14 billion cubic meters of natural gas in 1971. Consumption continued to exceed domestic production. Italy imported about 1 billion cubic meters of natural gas, principally from Libya. Imports were expected to increase to about 10 billion cubic meters; of that total, 3 billion will come from Libya, the remainder via pipeline from the Netherlands (through West Germany and Switzerland) and the U.S.S.R. (through Austria and Czechoslovakia). Detailed negotiations for the construction of the two pipelines was successfully completed in mid-1971.

On June 16 Esso Brega, a tanker of Esso Libya LNG Co., discharged the first load of liquefied natural gas (696 billion cubic meters) at the Panigaglia plant near La Spezia. The gas was revaporized and treated at Società Nazionale Metanodotti Progetti (SNAM) plant, thence delivered to the Italian pipeline network serving northern Italy.

Petroleum.—Domestic output of petroleum decreased 115,460 tons in 1971 and was over 2 percent below that of 1970. The reduced output resulted from lower production rates at the Ragusa and Gela oilfields as well as the difficulty of marketing the output at the Gela refinery because of its high sulfur content. Production of crude oil has been declining since 1964 because of depletion of resources in the Ragusa and Gela oilfields, the principal source of Italy's petroleum output.

Crude imports totaled 117.2 million tons, an increase of nearly 3 percent over 1970 levels. Middle East countries supplied 61 percent of imports and increased their share of the Italian market by 6 percent. Libya, however, remained the leading exporting country by supplying 25 percent of Italy's imports.

Per capita consumption of petroleum products was 1,400 kilograms in 1971 compared with 1,324 kilograms in 1970. The 1971 average for EEC Common Market countries was 2,351 kilograms.

Lumax Oil Co., an Italian-American venture, was producing crude oil and natural gas from a newly discovered oil and gasfield near Ripi, in the province of Frosinone. The producing horizon was at a depth of 300 meters.

Pipelines.—At yearend, Italy's pipeline network totaled 6,036 miles, an increase of over 13 percent. Over 400 miles of pipeline were in the process of construction during 1971.

Industria Meridionale Idrocarburi, a joint venture of Montedison and Snia Viscosa S.p.A., was building a system of pipeline laterals in the gasfield of Candela-Serra del Riposo and Ascoli Satriano. The fields have a production potential of 1 billion cubic meters.

An 88-kilometer pipeline between Leghorn and Florence was operational at yearend.

Finsider signed a 4-year contract for delivery of about 1 million tons of 56-inch pipe to Promsyrioimport of the Soviet Union. In addition, the U.S.S.R. agreed to purchase from Finsider 100,000 tons of seamless pipe for gas wells over a 2-year period. The purchases are a part of the Italo-Soviet agreement for the delivery of natural gas from the U.S.S.R. to Italy.

During 1971 SNAM negotiated right-of-way agreements to build a pipeline for transmission of natural gas to Italy from Holland and the U.S.S.R. gasfields. Transeuropa Naturgas Pipeline GmbH (TENP), a joint venture of SNAM, Italy and Ruhrgas, West Germany, will build and operate a 506-kilometer pipeline through West Germany and Switzerland.

ENI contracted to purchase 6 billion cubic meters of natural gas for a period of 20 years from N. V. Nederlandse Aardolie Maatschappij, a Dutch natural gas producer. The extention of the pipeline through Switzerland will be constructed by another company in a joint venture between SNAM and gas consuming industries of Switzerland.

SNAM started construction of a 16-inch diameter natural gas transmission pipeline through the Region of Calabria, connecting the main line at Pisticci. The line will trend southward from Pisticci, through Policora, across the Piano di Sibari, and thence the industrial area of Cosenza to a junction point at Santa Eufemia for a distance of 214 kilometers. From there, the pipeline will branch into two trunk lines; one for 120 kilometers to Reggio Calabria, the other for 90 kilometers to Crotone, passing through Catanzaro. At Crotone the pipeline was expected to junction with a gathering system constructed offshore to the newly discovered gasfield in the Ionian Sea.

The $8 million oil products pipeline between Stanic refinery in Leghorn and the city of Florence was completed at yearend. The pipeline carries fuel oil, gasoline, kerosine, and other petroleum products.

Refining.—Oil throughput at Italian refineries increased about 3 percent. The increase was the smallest in several years because of large inventories, weak domestic demand, and lower exports. Total crude run to stills in refineries totaled 120.0 million tons compared with 117.8 in 1970.

At yearend Azienda Nazionale Idrogenazione Combustibili S.p.A. (ANIC), an affiliate of ENI, was authorized to build an oil refinery having an annual capacity of 8 million tons near Venice. Soviet Union crude oil for the facility will be delivered via the Trieste-Central Europe pipeline, now under construction. ENI operates refineries at Sannazzarro de Burgondi, Gela, Porto Marghera, Leghorn, and Bari having a throughput of about 22 million tons in 1971.

The Stanic per Azioni Raffineria Padana Oli Minerli (SARPOM) petroleum refinery at Trecate was being enlarged to process 14 million tons of crude. The facility was scheduled for completion in 1972 and would become Italy's second largest refinery. SARPOM is a joint venture of Esso Standard Italiana S.p.A., Chevron Italiana S.p.A., and Texaco Italiana S.p.A.

At yearend British Petroleum Italiana completed construction of a refinery having a 4 million tons annual capacity at Volpiano. Crude oil was transported by the central European pipeline to Ferrara Erbognone, thence via a 50-centimeter spur line to the facility. Volpiano refinery is British Petroleum Italiana's first wholly owned plant in Italy.

Società Azionaria Raffinazione Oli Minerali (SAROM) was spending $32 million for expansion and modernization of the Ravenna oil facility. An offshore terminal for supertankers will be constructed and linked to the refinery by a 48-inch pipeline. The tank farm storage capacity was expected to be doubled. The designed capacity of the refinery would be increased by 8 million tons annually by the addition of new production equipment.

The construction of a 7.5-million-ton oil refinery in the Melilli-Priolo area, Sicily, was announced by government officials in a joint venture of private industry, namely Camelli Co., Garrone Co., and International Investment Association. The Camelli Co. operates and leases oil tankers, while Garrone Co. operates a 6.5-million-ton oil refinery in Genoa. The site of the refinery was originally planned to be near San Vito, Lo Capo, and Noto, locations in Sicily. However, approval was denied by local officials because of environmental problems. The agreement contained permission to expand capacity of the refinery to 14 million tons annually.

Exploration.—An international consortium was searching for oil and gas in the Adriatic Sea area. One group comprising of Agip Shell Italiana S.p.A. and Snia Viscosa S.p.A. was drilling two offshore wells, one near Rimini, the other near Pescara. The consortium reportedly discovered a new gasfield near Antonella.

A joint venture comprising of Agip Shell Italiana S.p.A. and EFIM were drilling wells near Giulianova and Anacona. Natural gas resources in the offshore areas of the Adriatic Sea were estimated in excess of 200 billion cubic meters.

The Government granted offshore exploration leases to local and foreign oil companies in zone "C" of the Italian Continental Shelf near Sicily. The currently active Gela oilfield was producing from leases which include zone "C".

ENI was expanding offshore exploration and production activities in the Adriatic Sea. The agency announced that production from the Garibaldi gasfield totaled 1.5 billion cubic meters in 1971. Production of natural gas from the Agostino field was commenced at yearend. ENI reported drilling 183 wells in the Adriatic since 1959; of these, 123 were productive.

Societa Italiana Resine (SIR) was drilling a production well on land near San Salvo to reach a gasfield situated over 1 kilometer offshore. SIR owns inland and offshore leases on nearly 2 million acres of land in the area.

The Mineral Industry of Japan

By K. P. Wang[1]

Japan's rapid growth as a world producer and consumer of mineral products was temporarily halted in 1971 as a result of a prolonged economic recession that started in the second half of 1970 and repercussions brought about by the United States new economic policy announced on August 15. Nonetheless, for most basic minerals and metals, Japan still ranked second to fourth as a processor and consumed 5 to 15 percent of the world supply. Since the country's many large, modern metallurgical plants and refineries depend primarily on imports to meet raw material requirements, Japan has also been a prominent international developer, trader, and shipper of minerals. The mining booms in Australia, Western Canada, Southeast Asia, and Central Africa have been triggered by Japan's soaring demand. Japan's new role in world mineral enterprises was discussed in special issues of two leading trade journals.[2]

Japan's 1971 gross national product (GNP) was estimated at 78.6 trillion yen, 10.8 percent above that of 1970. However, this growth was much less than the 17 percent average annual increase achieved during 1966–70. The official GNP estimate for fiscal year 1972[3] is 90.6 trillion yen (approximately $294 billion), up 12.9 percent in current yen and 7.7 percent in real yen over the previous fiscal year. A new monetary alignment was being formulated during the late months of the year, with the Japanese yen[4] distinctly up in value as compared with the U.S. dollar.

Whereas output of most minerals and metals roughly doubled between 1966 and 1970, the 1971 levels turned out to be of the same magnitude as a year earlier. Japan has had to revise downward industrial production and GNP targets. For example, the 1975 steel output target has been reduced from 150 million metric tons to 120 million tons or less.

On October 4, 1971, the Ministry of International Trade and Industry (MITI) published a white paper entitled "New Policy on Mineral Resources for the 1970's." This was completed before repercussions of the new U.S. economic policy could be fully evaluated. Although forecasts were on the high side and target dates may have to be postponed, the trend as to Japanese aspirations is clear. Historically, the white paper suggests that Japan's dollar consumption ratio of key minerals to GNP had surpassed all other major industrialized nations by 1969, with steel, copper, zinc, and nickel 2 to 3 times U.S. levels and oil and aluminum about one-third higher. By 1980, Japan expects to import 30 percent of all minerals imported worldwide and forecasts that $15 billion would be needed to finance worldwide exploration projects in the decade leading up to that year, in order to achieve announced targets. Specifically, Japan's mineral raw material requirements in 1980 were estimated as follows, in thousand metric tons:

Aluminum	3,400	Nickel	245
Coking coal	80,000	Petroleum	500,000
Copper	2,200	Uranium	9
Iron ore	150,000	Zinc	1,800
Lead	370		

Mineral processing in Japan, led by iron and steel manufacturing, nonferrous metal production, and fuel treatment, outweighed reported mining by at least 5 to 1 in value. During recent years, the relative importance of mining has declined, whereas mineral processing has gained. Using the index of 1965 = 100, the production outlook for Japanese Fiscal Year (JFY) 1971–72, as compared with JFY 1970, is shown below:

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[1] Supervisory physical scientist, Division of Nonmetallic Minerals.

[2] Engineering and Mining Journal (New York), November 1971; and Mining Magazine (London), November 1971.

[3] Japanese fiscal year (JFY) is from April of the year stated to March of the following year.

[4] As of Dec. 20, 1971, the value of the new exchange rate became 308 yen = US$1.00; before Aug. 15, 1971, the value of the exchange rate was 360 yen = US$1.00.

	JFY 1970	JFY 1971	JFY 1972
Mining	99.7	91.1	90.3
Iron and steel	229.6	220.7	235.5
Nonferrous metals	213.3	219.9	236.6
Metal products	251.7	261.8	287.6
Ceramics	177.9	179.0	189.6
Chemicals	209.2	219.5	236.2
Petroleum and coal products	223.7	233.6	254.3

Under the new policy, Japan intends to emphasize direct participation in development projects, seeking benefits of large-scale operation; diversification between supplier countries; more joint ventures in local processing with partners from developing countries; a means to link economic aid with these development projects and a way to avoid friction with companies of other nations.

As to the method to be employed, the white paper suggests that private firms should play a leading role, with government participation limited to "assistance and direction." In this latter area MITI appears to be assigning itself the new role of ensuring large and stable financing for exploration, exploitation, and development of overseas reserves; providing information and surveys on reserves; providing special tax and insurance treatment; providing guidance for the consolidation and rationalization of the resources industry; and developing Japan's Continental Shelf.

At yearend 1971, various measures were adopted to counteract the repercussions of the new U.S. economic policy and the realignment of world currencies. A sluggish local economy coupled with slackening world demand for Japanese goods meant that production would have to be cut and that construction of new facilities would have to slow down. This in turn greatly affected countries supplying Japan with raw materials in terms of reduced tonnage, lower prices, and unfavorable exchange rates since many contracts were made on the basis of the devalued dollar.

On December 8, Japan's Fair Trade Commission gave permission to major steel companies to form a temporary cartel for the purpose of orderly reduction in output and joint action in sales. Measures were taken to renegotiate both short-term and long-term delivery contracts, recognizing that output targets had to be realistically reviewed. Various "troubled" domestic mines were shut down permanently. Many plant units were closed temporarily and startups of new facilities were delayed. At least one new foreign ore contract was negotiated in yen rather than dollars. The nonferrous industry asked for and obtained relief with regard to facilitating shipment of ores and concentrates stockpiled at overseas mines and ports.

Early in January 1972, the President of the Japan Mining Industry Association[5] reviewed the problems facing the base metals industries and suggested that the Government take the following actions: Introduce tax and financial subsidies to cover foreign exchange losses related to overseas capital investments thereby counteracting the upward evaluation of the yen; increase subsidies to domestic operations, particularly with regard to coping with excessive supply of sulfuric acid generated through smelting; introduce special government payment systems for aid in exploitation following successful exploration programs domestically and abroad; immediately establish financing, taxation, and subsidy systems to cope with investments necessary for environmental pollution control; incorporate mineral acquisition into foreign trade policy in order to stabilize long-term supply and prices since recent import cuts have greatly impaired friendly relationships with countries supplying raw materials; and assist existing private organizations, such as the Japan Copper Fund Inc. and the Japan Rare Metal Corp., in terms of low-interest financing to acquire ingots and ore from abroad for buffer stockpiles with a view towards long-term stabilization.

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[5] Japan Metal Journal (Tokyo). Looking Ahead to 1972. Jan. 10, 1972, pp. 3–4.

PRODUCTION

Japan's mineral and metal production showed mixed results in 1971, after more than a decade of uninterrupted growth. Steel output was down 5 percent, although some production was apparently not reported. There was no great change in the production of refined copper and lead as compared with 1970. Refined zinc went up

5 percent, nickel up nearly 16 percent, and aluminum up 21 percent. Output of refined petroleum products was generally up, as follows: Distillate oil, 11 percent; naphtha, 14 percent; jet fuel, 12 percent; kerosine, little change; light oil, 10 percent; and residual fuel oil, 14 percent.

Japan's world ranking in certain major mineral and metal products during 1971 was as follows: Pyrite (1st); slab zinc and chemical fertilizers (2d); cement, refined copper, steel, and refined oil products (3d); aluminum and coke (4th); and refined lead (5th).

Table 1.—Japan: Production of mineral commodities

(Thousand metric tons unless otherwise specified)

Commodity	1969	1970	1971[p]
METALS			
Aluminum:			
Alumina, gross weight	1,064	1,285	1,603
Metal:			
Primary:			
Regular grades	565	728	887
High purity	4	5	6
Total	569	733	893
Secondary	281	322	349
Antimony:			
Mine output, metal content tons	5	6	3
Oxide do	2,963	2,828	2,449
Metal do	3,497	4,954	4,789
Arsenic, white (equivalent of arsenious acid) do	580	884	956
Bismuth do	695	678	812
Cadmium do	2,765	2,541	2,645
Chromium:			
Chromite, gross weight do	29,782	32,980	31,642
Metal do	1,205	1,596	2,082
Columbium and tantalum, tantalum metal do	15	25	15
Copper:			
Mine output, metal content	121	125	121
Metal:			
Blister	501	606	605
Refined:			
Primary	522	603	713
Secondary	108	102	
Germanium:			
Oxide tons	22	27	16
Metal do	27	29	19
Gold:			
Mine output, metal content thousand troy ounces	246	255	255
Metal do	677	709	773
Indium do	553	585	528
Iron and steel:			
Iron ore and iron sand concentrate	1,854	1,574	1,420
Roasted pyrite concentrate (50 percent or more Fe)	1,918	1,906	1,496
Pig iron and blast furnace ferroalloys	58,147	68,048	72,745
Electric furnace ferroalloys:			
Ferrochrome	259	362	403
Ferromanganese	382	444	534
Ferronickel	180	265	286
Ferrosilicon	225	302	322
Silicomanganese	230	270	325
Other[1]	21	24	95
Steel:			
Crude	82,166	93,322	88,557
Semimanufactures, hot rolled:			
Ordinary steel	60,483	68,552	65,171
Special steels	6,577	7,381	6,906
Lead:			
Mine output, metal content	63	64	71
Metal, refined:			
Primary	187	209	215
Secondary	48	46	47
Magesium:			
Primary tons	9,382	10,337	9,693
Secondary do	6,425	9,179	NA
Manganese:			
Ore and concentrate, gross weight	301	270	285
Oxide	38	40	42
Metal tons	7,218	9,444	9,956
Mercury:			
Mine output, metal content 76-pound flasks	5,613	5,170	5,308
Metal do	6,543	5,862	6,620

See footnotes at end of table.

Table 1.—Japan: Production of mineral commodities—Continued

(Thousand metric tons unless otherwise specified)

Commodity	1969	1970	1971 p
METALS—Continued			
Molybdenum:			
Concentrate output, metal content ..... tons	279	275	445
Metal ..... do	297	285	188
Nickel, primary ..... do	10,241	13,393	15,492
Platinum group:			
Palladium ..... troy ounces	3,877	4,610	5,381
Platinum ..... do	3,140	3,296	3,451
Rare-earth metals:			
Lanthanum oxide ..... tons	102	124	95
Cerium metal ..... do	116	153	114
Selenium, elemental ..... do	197	212	238
Silicon ..... do	87	200	160
Silver:			
Mine output, metal content ..... thousand troy ounces	10,811	11,030	11,540
Metal, primary ..... do	27,893	29,582	31,056
Tellurium, elemental ..... tons	23	35	36
Tin:			
Mine output, metal content ..... long tons	730	780	777
Metal, primary ..... do	1,377	1,365	1,355
Titanium:			
Concentrate, gross weight ..... tons	4,066	3,145	2,376
Slag ..... do	NA	7,877	5,531
Metal ..... do	6,462	9,230	6,777
Tungsten:			
Mine output, metal content ..... do	r 768	854	730
Metal ..... do	1,389	1,785	1,176
Uranium:			
Oxide ..... kilograms	902	169	NA
Metal ..... do	5,654	190	86
Zinc:			
Mine output, metal content	269	280	294
Oxide	20	17	59
Metal:			
Primary	712	676	708
Secondary	23	27	11
Zirconium ..... kilograms	54,654	17,460	24,378
NONMETALS			
Asbestos	r 21	21	18
Barite	62	66	58
Bromine, elemental	7,118	9,532	9,401
Cement, hydraulic	51,386	57,189	59,463
Clays:			
Fire clay	2,217	2,315	2,136
Kaolin	r 194	221	352
Feldspar [2]	r 489	525	499
Fertilizer materials:			
Crude potassic (potassium carbonate) ..... gross weight	19	20	19
Manufactured:			
Nitrogenous [3]	2,099	2,152	NA
Superphosphates	980	852	712
Fluorspar, all grades	r 13	8	13
Graphite (crystalline) ..... tons	1,726	1,465	1,054
Gypsum	562	539	536
Iodine, elemental ..... tons	4,619	5,898	6,748
Lime (quicklime)	4.225	9,172	9,919
Pyrite and pyrrhotite (including cupreous):			
Gross weight	2,966	2,764	2,363
Sulfur content	1,365	1,289	1,112
Salt, all types	981	961	946
Stone, sand and gravel, n.e.s.:			
Crushed and broken stone:			
Dolomite	2,355	2,575	2,706
Limestone	103,204	116,230	125,010
Sulfur, elemental:			
Native, other than Frasch [4]	204	r 103	65
Byproduct (recovered from petroleum refinery)	144	r 239	343
Sulfuric acid	6,760	6,928	6,659
Talc and related materials:			
Pyrophyllite	1,657	1,539	1,418
Talc	154	138	137
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	261	295	308
Coal:			
Anthracite	1,225	1,039	498
Bituminous [5]	43,466	42,611	32,935
Lignite	274	438	134
Total	44,965	44,088	33,567

See footnotes at end of table.

Table 1.—Japan: Production of mineral commodities—Continued

(Thousand metric tons unless otherwise specified)

Commodity	1969	1970	1971 p
MINERAL FUELS AND RELATED MATERIALS—Continued			
Coke:			
Metallurgical	31,013	36,374	36,881
Gashouse	5,009	4,778	4,793
Fuel briquets, all grades	3,241	2,978	1,423
Gas, natural:			
Gross production .... million cubic feet	77,890	83,311	85,936
Marketed .... do	76,173	[6] 82,682	85,156
Natural gas liquids:			
Natural gasoline .... thousand 42-gallon barrels	35	33	27
Liquefied natural gas .... do	539	NA	NA
Liquefied petroleum gas (from natural gas):			
From field plants .... do	127	120	123
From petrochemical plants .... do	33,338	NA	NA
Peat e	70	70	70
Petroleum:			
Crude oil .... thousand 42-gallon barrels	5,538	5,656	5,529
Refinery products:			
Gasoline:			
Aviation .... do	532	496	442
Other .... do	115,709	130,892	142,185
Jet fuel .... do	21,061	15,074	16,907
Kerosine .... do	81,216	110,053	110,491
Distillate fuel oil .... do	115,714	136,012	158,701
Residual fuel oil .... do	515,072	578,982	645,688
Lubricants .... do	12,881	15,104	16,091
Other:			
Asphalt and bitumen .... do	17,396	21,703	26,262
Liquefied petroleum gas .... do	32,832	39,807	43,012
Naphtha .... do	107,864	137,500	157,025
Paraffin .... do	913	1,058	917
Petroleum coke .... do	462	914	1,191
Unfinished oil .... do	---------	---------	42,871
Refinery fuel and losses .... do	42,311	44,341	51,362
Total .... do	1,063,963	1,231,936	1,413,145

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e Estimate. p Preliminary. r Revised. NA Not available.

[1] Includes (but not limited to) ferromolybdenum, ferrotungsten, ferrovanadium, and silicochromium.

[2] Includes aplite as follows, in thousand tons: 1969–428; 1970–479; 1971–441; and saba as follows in thousand tons: 1969–8; 1970–10; 1971–6.

[3] Year ended June 30 of that stated.

[4] Includes a small quantity of byproduct sulfur recovered from sulfide ores as well as sulfur content of sulfur ores.

[5] Includes a small amount of natural coke.

[6] Includes gas reinjected, if any.

TRADE

Japan's overall trade in 1971 totaled $43,780 million; exports totaled $24,085 million (officially converted by the Japanese from 8.39 trillion yen) and imports, $19,695 million. Mineral and related products were an important part of the total. Mineral exports during the year comprised about 18 percent of all exports, and mineral imports about 43 percent of all imports.

The leading mineral export was iron and steel, accounting in 1971 for more than 75 percent of the value of all mineral exports and nearly 15 percent of total commodity exports. Steel exports in 1971 approximated $3.5 billion.

The most important minerals imported in 1971 were as follows, with rounded value in billions of dollars: Crude oil, $3.0; iron ore, $1.3; coal, $1.0; nonferrous ores, $1.0 (nearly half copper); nonferrous metals, $0.7 ($0.3 for copper); refined petroleum, $0.6; and nonmetallics, $0.5.

Details on mineral exports and imports are given in the following tabulations in millions of U.S. dollars:

Exports	1970	1971 [1]
METALS		
Iron and steel	[r] 2,844	3,447
Iron and steel scrap	7	21
Nonferrous metals:		
Copper	141	88
Aluminum	39	49
Zinc	19	22
Other	49	41
NONMETALS		
Inorganic chemicals	107	158
Cement	29	31
Chemical fertilizers	[r] 143	152
Nonmetallic manufactures	372	390
MINERAL FUELS AND RELATED MATERIALS		
Petroleum refinery products	42	50
Other	12	11
Total:		
Mineral commodities	[r] 3,804	4,460
All commodities	19,318	24,085

[r] Revised.

[1] All mineral and metal data converted from reported yen values at the old exchange rate of 360 yen = US$1.00.

Imports	1970	1971 [1]
METALS		
Iron and steel:		
Iron ore	1,208	1,296
Scrap	[r] 319	121
Metal	276	109
Nonferrous metals:		
Ores and concentrates:		
Copper	503	438
Lead	41	36
Zinc	85	100
Nickel	173	168
Bauxite	37	46
Manganese	59	72
Other	166	122
Scrap	83	59
Metal:		
Copper	484	309
Silver and platinum group	117	114
Aluminum	139	115
Tin	102	97
Nickel	60	34
Other	44	24
NONMETALS		
Inorganic chemicals	125	89
Salt	60	65
Phosphate rock	68	61
Manufactured fertilizers (mainly potassic)	54	59
Other crude fertilizers and minerals	177	180
Nonmetallic manufactures	163	190
MINERAL FUELS AND RELATED MATERIALS		
Coal and coke	[r] 1,015	984
Petroleum:		
Crude	[r] 2,235	2,963
Refinery products	549	561
Other	105	120
Total:		
Mineral commodities	[r] 8,447	8,532
All commodities	18,881	19,695

[r] Revised.

[1] All mineral and metal data converted from reported yen values at the old exchange rate of 360 yen = US$1.00.

Table 2.—Japan: Exports of mineral commodities [1]

(Thousand metric tons unless otherwise specified)

Commodity	1969	1970	1971	Principal destinations, 1970
METALS				
Aluminum:				
Bauxite and concentrate tons	145	110	319	Taiwan 100.
Oxide (alumina) and hydroxide	113	126	250	United States 60; Republic of Korea 38; Taiwan 7.
Fused alumina tons	2,216	3,234	3,695	Taiwan 1,385; Republic of Korea 1,143.
Metal including alloys, all forms	45	54	107	United States 13; Singapore 6; Ryukyu Islands 5; Hong Kong 5.
Arsenic trioxide, pentoxide and acids tons	6	8	210	India 7.
Bismuth, metal, including alloys, all forms do	261	290	460	Netherlands 200; United Kingdom 30.
Cadmium, metal, including alloys, all forms do	772	945	1,190	United States 543; Netherlands 218.
Chromium:				
Chromite do	--	--	30	
Oxides and hydroxides do	3,154	3,569	4,693	United States 2,335; Republic of Korea 417.
Cobalt oxides and hydroxides do	3	5	6	North Korea 2; Republic of Korea 2.
Columbium and tantalum: tantalum, metal, including alloys, all forms do	1	2	1	Mainly to West Germany.
Copper:				
Copper sulfates do	450	445	1,045	Republic of Korea 294; Taiwan 62; Burma 50.
Metal including alloys, all forms do	53	86	67	United States 26; People's Republic of China 14; Taiwan 10.
Iron and steel:				
Ore and concentrate do	6	5	3	All to Singapore.
Roasted pyrite do	150	12,794	--	All to Republic of Korea.
Metal:				
Scrap do	80,368	82,804	373,133	Republic of Korea 69,906; Taiwan 11,622.
Pig iron including cast iron do	730	48	432,747	Taiwan 30; Ceylon 10.
Sponge iron, powder and shot do	5,778	5,884	6,501	United States 1,487; Australia 1,281.
Ferroalloys:				
Ferromanganese	11	8	19	Australia 3; United States 3.
Other	12	8	49	United States 3; Australia 1; Thailand 1.
Steel, primary forms	1,934	1,988	3,053	United States 417; Republic of Korea 272; Philippines 220; Argentina 208.
Semimanufactures:				
Bars, rods, angles, shapes and sections	2,112	2,334	3,448	United States 971; People's Republic of China 378; Taiwan 106; Thailand 104.
Universals, plates and sheets:				
Plates and sheets, uncoated	6,724	7,770	10,055	United States 2,021; People's Republic of China 687; Italy 387; Taiwan 368.
Tinned plates and sheets	549	611	786	United States 180; Taiwan 48; People's Republic of China 33; Philippines 33.
Other coated plates and sheets	1,020	1,190	1,375	United States 570; Italy 73; People's Republic of China 36; Brazil 35.
Hoop and strip	376	392	518	United States 87; Thailand 35; Singapore 28; Canada 22; Malaysia 21.
Rails and accessories	54	66	98	Thailand 24; People's Republic of China 12; Taiwan 11.
Wire	460	475	550	United States 255; Indonesia 27; Thailand 21.
Tubes, pipes, and fittings	2,261	2,686	3,211	United States 1,073; People's Republic of China 360; U.S.S.R. 101; Canada 94.
Castings and forgings, rough	1	6	15	United States 5.

See footnotes at end of table.

Table 2.—Japan: Exports of mineral commodities [1]—Continued

(Thousand metric tons unless otherwise specified)

Commodity	1969	1970	1971	Principal destinations, 1970
METALS—Continued				
Lead:				
Ore and concentrate----tons--	--	--	1,053	
Oxides----do----	116	122	84	Singapore 64; Republic of Korea 29; Indonesia 12.
Metal including alloys, all forms----	3	7	6	Republic of Korea 2; Taiwan 1; Thailand 1.
Magnesium metal, including alloys, all forms tons--	974	77	49	People's Republic of China 30; North Korea 25.
Manganese:				
Ore and concentrate----do----	2,277	2,947	3,142	Pakistan 1,036; South Vietnam 450.
Oxides----	31	34	34	United Kingdom 4; Hong Kong 3; United States 3.
Mercury----76-pound flasks--	1,096	366	968	Republic of Korea 207; Thailand 88; Taiwan 54.
Molybdenum metal, including alloys, all forms tons--	18	17	23	West Germany 5; Taiwan 4; Hong Kong 4.
Nickel metal, including alloys, all forms---do----	522	1,231	843	Republic of Korea 256; Hong Kong 250; India 141.
Phosphorus, elemental (red)----do----	645	655	616	India 333; United States 117.
Platinum group:				
Waste and sweepings (including silver waste and sweepings)----do----	--	988	2	All to United Kingdom.
Metal----thousand troy ounces--	61	47	19	United States 19; United Kingdom 11; People's Republic of China 8.
Selenium, elemental----tons--	28	26	65	India 9; Netherlands 3; West Germany 2.
Silicon carbide (abrasives)----do----	1,833	1,758	1,766	Taiwan 724; Republic of Korea 604; Australia 142.
Silver including alloys----thousand troy ounces--	1,489	257	685	Taiwan 140; Republic of Korea 31; Philippines 26.
Tin:				
Oxides----long tons--	13	32	6	United Kingdom 19; Czechoslovakia 5.
Metal including alloys, all forms----do----	751	1,556	955	Taiwan 636; Singapore 316; Philippines 224.
Titanium:				
Oxide----	42	37	14	United States 14; Taiwan 3; Sweden 3.
Metal including alloys, all forms----tons--	4,695	5,022	3,191	United States 3,758; United Kingdom 402; France 287.
Tungsten metal, including alloys, all forms do----	34	51	92	U.S.S.R. 18; West Germany 14.
Uranium and thorium oxides, including rare earths oxides----do----	59	97	116	United Kingdom 65; West Germany 13; Republic of Korea 10.
Zinc:				
Ore and concentrate----do----	50	--	--	
Oxides----do----	2,588	726	1,384	Taiwan 327; Republic of Korea 149; Thailand 109.
Metal including alloys, all forms----	101	80	70	United States 27; Thailand 20; Republic of Korea 8; Taiwan 6.
Other:				
Ore and concentrate:				
Of titanium, molybdenum, tantalum, vanadium, and zirconium----tons--	90	53	709	Republic of Korea 50.
Of base metals, n.e.s----do----	6	122	--	Taiwan 70; Belgium 50.
Ash and residues, containing nonferrous metals----do----	1,849	3,489	4,318	Belgium 1,959; Ryukyu Islands 990.
Oxides, hydroxides and peroxides of metal, n.e.s----do----	1,651	2,045	3,155	United States 986; Canada 163; Netherlands 89.
Metals including alloys, all forms:				
Phosphorus and other metalloids do----	338	261	50	Australia 105; Taiwan 43; India 43.

See footnotes at end of table.

Table 2.—Japan: Exports of mineral commodities [1]—Continued

(Thousand metric tons unless otherwise specified)

Commodity	1969	1970	1971	Principal destinations, 1970
METALS—Continued				
Other—Continued				
Metals including alloys all forms—Continued				
Alkali, alkaline-earth and rare-earth metals tons	63	149	130	Canada 101; Taiwan 25.
Pyrophoric alloys do	140	114	137	Hong Kong 34; Singapore 18; United States 14.
Base metals including alloys, all forms, n.e.s do	3,025	6,672	8,202	Netherlands 2,310; West Germany 1,229; United States 867.
NONMETALS				
Abrasives, natural, n.e.s.:				
Emery do	807	672	924	Taiwan 478; Republic of Korea 92.
Natural abrasives do	2,200	4,253	279	Ryukyu Islands 4,085.
Dust and powder of precious and semiprecious stones thousand carats	824	410	6,922	United States 321; United Kingdom 72.
Grinding and polishing wheels and stones tons	2,546	2,800	2,999	United States 408; Taiwan 298; Thailand 234; Hong Kong 131.
Asbestos do	1,471	169	493	Taiwan 108; Thailand 15.
Barite and witherite do	3,502	--	210	
Boron oxide and acid do	64	61	85	Taiwan 27; Republic of Korea 19.
Cement	2,134	2,112	2,322	Indonesia 436; Singapore 337; Ryukyu Islands 286; Kuwait 260.
Chalk tons	2,360	700	2,621	Hong Kong 410; Malaysia 200.
Clays and products (including all refractory brick):				
Crude clays, n.e.s do	41,768	63,719	44,376	Taiwan 16,909; Philippines 15,813; Singapore 11,555.
Products [2] do	135,344	135,885	162,483	United States 30,048; Australia 12,811; Thailand 10,854; Republic of Korea 8,810.
Cryolite and chiolite do	49	300	341	United States 200.
Diamond:				
Gem not set or strung carats	325	330	4,415	United States 180; Israel 55.
Industrial thousand carats	118	80	148	United Kingdom 34; United States 27.
Diatomite and other infusorial earths tons	2,007	1,021	1,414	Taiwan 283; Australia 194; Thailand 130; Philippines 119.
Feldspar and fluorspar do	10,617	4,968	10,085	Taiwan 2,650; Republic of Korea 994.
Fertilizer materials:				
Manufactured:				
Nitrogenous [3]	1,112	1,147	1,338	People's Republic of China 720; Philippines 100; Indonesia 85.
Other	223	[r] 243	211	Thailand 117; Ryukyu Islands 38; Republic of Korea 16.
Ammonia tons	11,667	91,812	104,486	Philippines 65,697; Mozambique 22,499.
Graphite do	960	758	801	Thailand 296; Taiwan 240.
Gypsum and plaster	17	28	7	Republic of Korea 10; Ryukyu Islands 9; Singapore 5.
Iodine tons	3,581	4,653	5,637	United States 2,013; West Germany 690; France 489.
Kyanite and related materials do	2,525	4,122	3,995	Taiwan 3,993.
Lime do	8,688	5,904	8,780	South Vietnam 3,923; Ryukyu Islands 1,124.
Magnesite do	191	742	408	Pakistan 374; Republic of Korea 160.
Mica do	142	80	199	Taiwan 35; Thailand 13; Republic of Korea 12.
Pigments, mineral, including processed iron oxides do	1,080	1,482	1,165	Taiwan 618; U.S.S.R. 400; United States 246.

See footnotes at end of table.

Table 2.—Japan: Exports of mineral commodities [1]—Continued

(Thousand metric tons unless otherwise specified)

Commodity	1969	1970	1971	Principal destinations, 1970
NONMETALS—Continued				
Precious and semiprecious stones, except diamond thousand carats	102,395	68,101	225,181	United States 34,719; West Germany 6,347; Republic of Korea 5,340.
Salt and brines tons	1,305	344	1,018	Republic of Korea 95; United States 91; Ryukyu Islands 83.
Sodium and potassium compounds, n.e.s	214	207	293	Australia 181; U.S.S.R. 9; Indonesia 4; Hong Kong 4.
Stone, sand and gravel:				
Dimension stone	3	3	2	Ryukyu Islands 1; Singapore 1.
Dolomite, chiefly refractory grade	4	5	3	Philippines 2; Ryukyu Islands 1.
Gravel and crushed rock tons	3,419	873	3,990	Ryukyu Islands 394; Singapore 98.
Limestone (except dimension)	828	826	674	Australia 569; Hong Kong 249.
Quartz and quartzite tons	130	241	270	Taiwan 115; Thailand 102.
Sand (excluding metal bearing)	8	11	14	Philippines 5; Republic of Korea 5.
Sulfur:				
Elemental, all forms	30	2	13	Republic of Korea 1.
Sulfur dioxide tons	72	115	219	Australia 108.
Sulfuric acid do	1,788	1,081	886	Ryukyu Islands 518; Hong Kong 280; Republic of Korea 225.
Talc and steatite do	443	825	1,854	Ryukyu Islands 156; Cuba 145; Venezuela 145.
Other nonmetals, n.e.s.:				
Crude	10	11	8	Singapore 4; Hong Kong 2; Taiwan 2.
Slag, dross and similar waste, not metal bearing	6	14	32	Republic of Korea 8; Ryukyu Islands 4.
Oxides, hydroxides and peroxides of magnesium, strontium, and barium (including magnesia clinker)	49	61	84	Australia 34; Venezuela 6; United States 5; Taiwan 4.
Fluorine and bromine kilograms	1,790	919	1,350	Republic of Korea 300; Pakistan 240; Indonesia 229.
Building materials of asphalt, asbestos, and fiber cement, and unfired nonmetals, n.e.s	31	107	27	Guam 59; Ryukyu Islands 21; United States 20.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural tons	15	3	3	All to Republic of Korea.
Carbon black	16	19	26	Taiwan 4; Thailand 3; People's Republic of China 3.
Gas carbon kilograms	9	61	--	All to Surinam.
Coal, all grades, including briquets	23	16	18	Republic of Korea 15.
Coke and semicoke	84	94	259	Republic of Korea 60; Philippines 13.
Hydrogen and rare gases (helium, neon, argon, krypton, and xenon) tons	186	307	275	Singapore 40; Philippines 33; Republic of South Africa 32.
Gas, manufactured only do	67	7	3	American Samoa 4.
Peat, including peat briquets and litter do	20	70	90	All to Taiwan.
Petroleum:				
Crude and partly refined thousand 42-gallon barrels	3	720	684	Republic of Korea 719.
Refinery products:				
Nonbunker:				
Gasoline do	562	472	483	Australia 294; Hong Kong 159.
Naphtha do	135	37	31	Ryukyu Islands 25; United States 10.
Kerosine and jet fuel oil do	4,361	1,188	3,016	United States 660; Hong Kong 200; India 136.
Distillate fuel oils do	593	204	884	Hong Kong 112; Mexico 61; Singapore 12.
Residual fuel oil do	8	275	531	Indonesia 264.
Lubricants do	[r] 1,626	[r] 2,227	2,472	Singapore 500; Republic of Korea 469; Taiwan 301; Philippines 240.

See footnotes at end of table.

Table 2.—Japan: Exports of mineral commodities [1]—Continued

(Thousand metric tons unless otherwise specified)

Commodity	1969	1970	1971	Principal destinations, 1970
MINERAL FUELS AND RELATED MATERIALS—Continued				
Petroleum—Continued				
Refinery products—Continued				
Nonbunker—Continued				
Mineral jelly and wax thousand 42-gallon barrels	197	244	301	Republic of South Africa 45; Republic of Korea 35; Peru 23; Taiwan 17.
Bitumen do	[r] 1,194	[r] 1,035	482	Indonesia 678; U.S.S.R. 166; Ryukyu Islands 10.
Liquefied petroleum gas do	239	500	696	Ryukyu Islands 325; Hong Kong 82.
Other do	[r] 458	[r] 440	136	Taiwan 240; Republic of Korea 121; Thailand 16.
Bunker: [4]				
Kerosine and jet fuel do	[r] 7,349	8,072	NA	NA.
Distillate fuel oil do	[r] 7,593	8,133	NA	NA.
Residual fuel oil do	[r] 89,655	91,757	NA	NA.
Other do	179	208	NA	NA.

[r] Revised. NA Not available.

[1] Excludes exports under Japanese-United States Mutual Defense Agreement or for account of U.S. military forces.

[2] Excludes mosaic tile valued at (thousand yen): 1969–19,308,856; 1970–13,461,658; 1971–15,119,569.

[3] Excludes exports of following amounts of urea containing more than 45 percent nitrogen: 1969—1,400,601 tons; 1970—1,416,665 tons; and 1971—1,797,950 tons.

[4] Ministry of International Trade and Industry. Yearbook of Petroleum Statistics for 1969 and 1970.

Table 3.—Japan: Imports of mineral commodities [1]

(Thousand metric tons unless otherwise specified)

Commodity	1969	1970	1971	Principal sources, 1970
METALS				
Aluminum:				
Bauxite and concentrate	3,122	3,660	4,669	Australia 1,845; Indonesia 1,033; Malaysia 691.
Oxide and hydroxide	223	351	506	Australia 344.
Fused alumina (artificial corundum) tons	1,353	1,028	2,213	United States 799.
Metal including alloys:				
Scrap	19	11	12	United States 5; Ryukyu Islands 1; Hong Kong 1.
Unwrought	314	258	226	Canada 83; United States 74; Australia 48.
Semimanufactures	5	3	4	United States 2.
Antimony:				
Ore and concentrate tons	12,657	17,344	10,197	Bolivia 10,630; Thailand 1,745.
Metal including alloys, all forms do	5	20	([2])	West Germany 15.
Arsenic:				
Natural sulfides do	50	57	10	All from People's Republic of China.
Trioxide, pentoxide and acids do	2,638	933	605	U.S.S.R. 680; People's Republic of China 243.
Beryllium metal, including alloys, all forms kilograms	1,135	2,710	3,276	All from United States.
Bismuth metal, including alloys, all forms tons	37	32	1	United States 26.
Cadmium metal, including alloys, all forms kilograms	9,232	--	52	
Chromium:				
Ore and concentrate	733	1,150	1,162	Republic of South Africa 710; India 156.
Oxide and hydroxide tons	262	520	739	West Germany 343.
Cobalt:				
Oxide and hydroxide do	561	729	580	Belgium 702.
Metal including alloys, all forms do	4,231	4,638	1,470	Zaire (formerly Congo–Kinshasa) 3,544.
Columbium and tantalum:				
Tantalum:				
Ore and concentrate do	108	115	105	West Germany 28; Nigeria 23; Brazil 22.
Metal including alloys, all forms do	22	43	23	United States 38.

See footnotes at end of table.

Table 3.—Japan: Imports of mineral commodities [1]—Continued

(Thousand metric tons unless otherwise specified)

Commodity	1969	1970	1971	Principal sources, 1970
METALS—Continued				
Copper:				
Ore and concentrate	1,120	1,565	1,926	Philippines 625; Canada 459; United States 125.
Matte	31	24	9	Chile 12; Republic of South Africa 4; Taiwan 3.
Metal including alloys:				
Scrap	50	66	54	United States 41; Hong Kong 6; Canada 4.
Unwrought	361	313	282	Zambia 179; Chile 48.
Semimanufactures	5	2	2	Mainly from United States.
Germanium:				
Dioxide tons	24	26	15	Belgium 22.
Metal including alloys, all forms do	2	1	1	Mainly from U.S.S.R.
Iron and steel:				
Ore and concentrate (including roasted pyrites)	83,247	102,090	114,951	Australia 36,597; India 16,522; Chile 7,986.
Scrap	4,878	5,793	2,552	United States 4,637; Australia 488; India 238.
Pig iron including cast iron	3,577	2,854	1,183	Republic of South Africa 522; India 440; East Germany 373; U.S.S.R. 307.
Sponge iron, powder and shot	46	41	15	North Korea 14; Sweden 17; Canada 9.
Ferroalloys	85	149	48	Republic of South Africa 54; India 52.
Steel, primary forms	106	80	29	India 23; Republic of Korea 17; Australia 13; United States 11.
Semimanufactures	37	38	23	United States 12; Republic of Korea 8; Taiwan 5; Ryukyu Islands 4.
Lead:				
Ore and concentrate	180	210	225	Canada 125; Peru 28; Australia 23.
Oxides tons	30	75	176	United States 51.
Metal including alloys:				
Scrap do	2,013	2,639	1,759	Ryukyu Islands 1,410; South Vietnam 1,229.
Unwrought	8	2	4	Republic of Korea 1.
Semimanufactures tons	22	38	42	United States 33; West Germany 4.
Magnesium metal, including alloys, all forms do	102	2,280	1,055	United States 1,308; Norway 542.
Manganese ore and concentrate [3]	2,025	2,584	3,243	India 992; Republic of South Africa 698; Australia 457.
Mercury 76-pound flasks	25,573	36,103	15,045	Mexico 15,468; Spain 6,448; Philippines 3,879.
Molybdenum:				
Ore and concentrate tons	12,237	15,121	12,814	United States 8,541; Canada 4,581.
Trioxide do	112	[r] 241	20	Mainly from United States.
Metal including alloys, all forms do	106	144	44	West Germany 104; United States 33.
Nickel:				
Ore and concentrate	3,395	4,670	4,903	New Caledonia 4,009; Indonesia 525.
Matte, speiss, and similar materials	17	18	16	Canada 11.
Metal including alloys:				
Scrap tons	1,323	1,425	912	United States 712; United Kingdom 293.
Unwrought do	6,839	11,430	9,356	U.S.S.R. 4,613; Canada 2,395; Republic of South Africa 2,346.
Semimanufactures do	1,488	1,519	1,337	United Kingdom 414; United States 411; Canada 356.
Platinum-group metals including alloys, all forms:				
Platinum thousand troy ounces	278	465	646	United Kingdom 170; U.S.S.R. 126.
Palladium do	492	633	699	U.S.S.R. 574; Republic of South Africa 30.

See footnotes at end of table.

Table 3.—Japan: Imports of mineral commodities [1]—Continued

(Thousand metric tons unless otherwise specified)

Commodity	1969	1970	1971	Principal sources, 1970
METALS—Continued				
Rare earth:				
Oxides and crude chlorides ---- tons	2,772	2,420	2,471	India 1,655; Brazil 663.
Metals (yttrium and scandium) kilograms	7,038	52	148	France 20; West Germany 20.
Selenium, elemental ---- do	3,377	5,848	1,915	United States 2,669; Mexico 2,000.
Silicon ---- tons	4,744	4,285	809	United States 2,514; Canada 800; Yugoslavia 762.
Silver:				
Ores and concentrate ---- do	10,266	5,840	6,376	Republic of Korea 2,991; Peru 2,605.
Metals including alloys, all forms thousand troy ounces	10,460	13,282	9,950	United States 4,562; Peru 3,517; Australia 3,396.
Tellurium ---- kilograms	122	4,101	1,280	Canada 4,001.
Tin:				
Ore and concentrate ---- long tons	22	245	18	Indonesia 177; Bolivia 58.
Oxide ---- do	(2)	1	5	Mainly from United States.
Metal including alloys, all forms do	25,565	26,468	27,274	Malaysia 23,853; Indonesia 1,132.
Titanium:				
Ore and concentrate	410	588	554	Australia 260; Malaysia 170.
Slag	--	--	50	
Oxides (includes slag) ---- tons	4,192	6,155	6,167	United Kingdom 3,043; United States 1,517.
Tungsten:				
Ore and concentrate ---- do	4,865	6,160	2,756	United States 1,856; Republic of Korea 1,454; Thailand 628.
Metals including alloys, all forms do	67	125	59	West Germany 66; United States 31; France 20.
Uranium and thorium:				
Ore and concentrate ---- do	111	50	180	All from Malaysia.
Oxides (compounds of thorium or uranium depleted in U^{235}) kilograms	34,184	83,407	37,461	Australia 50,800; France 25,797.
Metal including alloys, all forms do	11,267	2,745	1	United States 1,377; United Kingdom 1,336.
Vanadium pentoxide ---- tons	2,180	2,807	2,317	Republic of South Africa 1,309; United States 578.
Zinc:				
Ore and concentrate	847	973	1,076	Peru 298; Canada 245; Australia 168.
Oxide ---- tons	153	383	264	U.S.S.R. 240; West Germany 70.
Metal including alloys, all forms	8	22	14	Canada 8; North Korea 7; Australia 5.
Zirconium ore and concentrate including zircon sand ---- tons	62,106	94,275	76,588	Australia 91,060.
Other:				
Ore and concentrate of base metals, n.e.s. including columbium ---- do	3,678	r 3,132	3,150	Australia 1,098; Nigeria 791; Republic of South Africa 304.
Ash and residue containing nonferrous metals ---- do	18,176	15,941	14,911	United States 3,974; Australia 2,484; India 1,889; Malaysia 1,363.
Oxides, hydroxides, and peroxides of metals, n.e.s.[4] ---- do	1,140	1,509	1,201	United States 1,312; West Germany 105.
Metals including alloys, all forms:				
Metalloids [5] ---- do	2,260	2,835	4,954	U.S.S.R. 1,391; West Germany 994.
Alkali and alkaline-earth metals [6] ---- do	467	602	29	U.S.S.R. 310; United Kingdom 229.
Pyrophoric alloys (ferrocerium) ---- do	17	13	7	Australia 4; Austria 4; West Germany 3.
Base-metals including alloys, all forms n.e.s.[7] ---- do	402	761	1,209	U.S.S.R. 476; United States 172.

See footnotes at end of table.

Table 3.—Japan: Imports of mineral commodities [1]—Continued

(Thousand metric tons unless otherwise specified)

Commodity	1969	1970	1971	Principal sources, 1970
NONMETALS				
Abrasives, natural, except diamond, n.e.s.:				
Crude .... tons..	5,049	4,347	2,755	United States 2,283; Italy 1,005.
Dust and powder of precious and semiprecious stones .... kilograms..	(2)	13,133	18	Mainly from Republic of South Africa.
Grinding and polishing wheels and stones .... tons..	[3] 210	[r] 261	308	United States 122; West Germany 67.
Asbestos	237	298	274	Canada 154; Republic of South Africa 94.
Barite and witherite	29	29	9	People's Republic of China 21; India 6.
Boron materials:				
Crude natural borates	22	28	24	Turkey 23; United States 4.
Oxide and acid	14	15	4	United States 13.
Cement	2	3	5	United States 2.
Clays and products:				
Crude n.e.s.:				
Kaolin	137	243	249	United States 118; Republic of Korea 92.
Kyanite, andalusite and sillimanite	35	39	26	Republic of South Africa 23; India 14.
Other	230	351	498	United States 103; Republic of South Africa 98.
Products:				
Refractory including nonclay bricks .... tons..	6,874	6,852	7,032	United States 4,358; Taiwan 1,553.
Nonrefractory .... do....	455	2,273	1,578	United States 1,467; Italy 340.
Cryolite and chiolite	9	9	8	Denmark 7.
Diamond:				
Gem not set or strung .... thousand carats..	591	266	384	Israel 107; Belgium 78; United States 34.
Industrial stones .... do....	651	772	672	United States 244; Belgium 180; United Kingdom 155.
Powder and dust .... do....	4,936	5,446	5,118	United States 3,100; United Kingdom 1,663.
Diatomite and other infusorial earths .... tons..	1,487	2,944	2,104	United States 2,894.
Feldspar, leucite, nepheline, and nepheline syenite .... do....	10,355	5,915	2,468	India 2,765; Canada 2,032.
Fertilizer materials:				
Crude:				
Nitrogenous (natural sodium nitrate)	15	15	1	All from Chile.
Phosphatic	2,964	3,125	2,985	United States 1,848; Morocco 587.
Other .... tons..	1,062	63	79	United States 44; France 19.
Manufactured:				
Nitrogenous	13	11	7	Chile 4; United States 4.
Phosphatic	17	13	1	All from United States.
Potassic	1,361	1,333	1,271	Canada 535; United States 273.
Mixed	30	49	67	United States 48.
Ammonia .... tons..	17,271	50,181	1	All from United States.
Fluorspar	522	521	678	Thailand 258; People's Republic of China 122; Republic of South Africa 73.
Graphite, natural	58	77	56	Republic of Korea 49; North Korea 13.
Gypsum and plasters	61	77	89	Morocco 54; Mexico 13.
Kyanite and related materials	35	39	26	Republic of South Africa 23; India 14.
Lime .... tons..	--	19	2,500	All from United States.
Magnesite and magnesia clinker	27	59	37	North Korea 50; People's Republic of China 5.
Mica, all forms	7	11	7	India 7; United States 1.
Pigments, mineral including processed iron oxides .... tons..	1,689	2,546	2,398	West Germany 1,840.

See footnotes at end of table.

Table 3.—Japan: Imports of mineral commodities [1]—Continued

(Thousand metric tons unless otherwise specified)

Commodity	1969	1970	1971	Principal sources, 1970
NONMETALS—Continued				
Precious and semiprecious stones, except diamond:				
Natural ______ kilograms	723,037	898,703	883,310	Brazil 626,364; Republic of South Africa 130,662; India 55,623.
Manufactured ______ do	4,239	9,078	10,777	United States 8,039; Switzerland 943.
Pyrite (gross weight)	55	184	(2)	Philippines 75; U.S.S.R. 45.
Salt	5,657	6,490	7,254	Mexico 2,377; Australia 2,283.
Sodium and potassium compounds n.e.s.:				
Caustic soda ______ tons	61	5,757	186	United States 5,685.
Caustic potash, sodium peroxide ______ do	15	40	10	All from West Germany.
Stone, sand and gravel:				
Dimension stone	77	115	159	Republic of South Africa 45; Sweden 15; India 9.
Dolomite including agglomerated dolomite	17	27	24	Mainly from Republic of Korea.
Gravel and crushed rock	18	24	21	France 9; Republic of Korea 5; People's Republic of China 5.
Quartz and quartzite	152	208	155	Republic of Korea 182; India 7.
Sand excluding metal bearing	122	186	185	Australia 173.
Sulfur, colloidal, sublimed or precipitated ______ kilograms	23,039	44,224	275,998	United States 40,647.
Talc, steatite, soapstone and pyrophyllite	155	158	173	People's Republic of China 53; North Korea 34; Republic of Korea 33.
Other nonmetals n.e.s.:				
Crude:				
Meerschaum, amber and jet ______ kilograms	205	100	10	All from U.S.S.R.
Other	107	137	157	Philippines 49; Australia 27; Republic of Korea 23.
Slag, dross and similar waste and ash including kelp, not metal bearing	157	137	146	India 54; Republic of Korea 51.
Oxides, hydroxides and peroxides of magnesium, strontium, and barium ______ tons	404	224	120	United States 134; France 40; People's Republic of China 30.
Bromine and iodine ______ kilograms	60,416	124,800	273,020	All from Israel.
Fluorine ______ do	34	53	228	All from United States.
Building materials of asphalt, asbestos-cement, cellulose fibre-cement or the like ______ tons	2,793	4,587	5,366	Canada 3,952.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	3	3	2	All from United States.
Carbon black	3	5	4	United States 4.
Coal and briquets:				
Anthracite	1,301	1,405	1,584	Republic of Korea 324; Republic of South Africa 271; North Vietnam 227; People's Republic of China 227.
Bituminous:				
Heavy coking coal, less than 8 percent ash	19,794	21,838	20,174	United States 17,344; Australia 2,370.
Heavy coking coal, more than 8 percent ash	10,417	16,960	15,969	Australia 8,284; United States 4,654; Canada 2,689.
Other coking coal	9,650	9,970	9,197	Australia 5,817; United States 3,241.
Lignite and lignite briquets	26	14	13	All from Australia.
Coke and semicoke	173	146	41	Australia 67; United States 39.
Gas, hydrocarbon (liquefied natural gas) ______ thousand 42-gallon barrels	[r] 609	[r] 9,839	11,390	All from United States.
Hydrogen, helium and rare gases ______ kilograms	59,445	71,859	92,476	United States 51,308; Canada 20,427.

See footnotes at end of table.

Table 3.—Japan: Imports of mineral commodities [1]—Continued

(Thousand metric tons unless otherwise specified)

Commodity	1969	1970	1971	Principal sources, 1970
MINERAL FUELS AND RELATED MATERIALS—Continued				
Peat including peat briquets and litter tons	448	547	1,455	Denmark 217; United Kingdom 138.
Petroleum:				
Crude and partly refined:				
Crude thousand 42-gallon barrels	963,484	1,142,173	1,332,516	Iran 537,940; Indonesia 158,913; Saudi Arabia 120,781.
Partly refined do	89,623	97,597	66,918	Saudi Arabia 61,637; Kuwait-Saudi Arabia Neutral Zone 21,591; Kuwait 5,181.
Refinery products:				
Naphtha do	28,321	41,317	37,436	Kuwait 15,635; Saudi Arabia 9,739; Singapore 3,855.
Kerosine and jet fuel do	1,541	2,103	2,063	Singapore 1,632; Kuwait 282.
Distillate fuel oil do	12,008	15,713	15,787	Kuwait 3,812; Netherlands West Indies 3,553; U.S.S.R. 3,107.
Residual fuel oil do	96,609	142,857	129,146	Singapore 24,620; Indonesia 21,312; Kuwait 19,311.
Lubricants do	2,863	r 2,337	2,782	United States 2,007.
Liquefied petroleum gas do	r 25,505	r 31,126	38,394	Kuwait 11,961; Saudi Arabia 11,154.
Petroleum coke do	10,697	14,150	9,016	United States 13,026.
Other do	r 5,721	r 302	369	United States 276.
Mineral tar and other coal, petroleum, or gas derived crude chemicals	15	10	24	Netherlands West Indies 4; Republic of Korea 3.

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r Revised.

[1] Excludes imports under Japanese-United States Mutual Defense Agreement or for account of U.S. military forces.

[2] Less than ½ unit.

[3] Includes ferruginous manganese and manganese dioxide.

[4] Includes lithium hydroxide, beryllium oxide, mercury oxide, antimony trioxide, cuprous oxide and nickel oxide, inorganic bases and metallic oxides, hydroxides and peroxides, n.e.s., and silicon dioxides.

[5] Includes phosphorus, boron, and arsenic.

[6] Includes lithium, sodium, alkali-metals, n.e.s., and alkaline-earth metals.

[7] Includes base metals and scrap of base metals.

[8] Excludes cutting and grinding wheels of agglomerated diamond valued at 117,609,000 yens.

COMMODITY REVIEW

METALS

Aluminum.—Aluminum was one of few basic industries showing a notable gain in 1971. Total 1971 production of approximately 1.2 million metric tons, nearly three-fourths primary aluminum, ranked Japan second only to the United States among free world producers. Output of primary aluminum was 22 percent higher than in 1970, whereas secondary aluminum held its own. Although demand became sluggish in the last half of the year, imports remained high because of long-term contracts. This created a surplus situation and production was reduced 8 to 10 percent below capacity. Japanese aluminum producers would like to reduce imports below 150,000 tons per year and utilize more of the available capacity. Japan's output and annual capacity for aluminum and alumina, by plants, are shown in the following tabulation in thousand metric tons:

Company and location	Output fiscal year 1970 [1]	Capacity	
		Dec. 31, 1971	Planned
Nippon Light Metal Co., Ltd:			
Shimizu (alumina)	472	520	520
Kambara No. 1 (aluminum)	63	65	65
Kambara No. 2 (aluminum)	48	50	50
Niigata (aluminum)	58	143	143
Tomakomai (alumina)	--	60	360
Tomakomai No. 1 (aluminum)	54	60	--
Tomakomai No. 2 (aluminum)	--	70	200
Total:			
Alumina	472	580	880
Aluminum	223	388	458
Showa Denko Co., Ltd:			
Yokohama (alumina)	403	540	540
Kitakata No. 1 (aluminum)	29	29	29
Kitakata No. 2 (aluminum)	14	14	--
Omachi (aluminum)	42	48	43
Chiba No. 1 (aluminum)	83	85	85
Chiba No. 2 (aluminum)	25	80	130
Total:			
Alumina	403	540	540
Aluminum	193	251	287
Sumitomo Chemical Co., Ltd:			
Kikumoto (alumina)	468	580	580
Kikumoto No. 1 (aluminum)	5	--	--
Kikumoto No. 2 (aluminum)	22	24	24
Nagoya (aluminum)	51	50	50
Isoura (aluminum)	80	76	76
Toyama (aluminum)	44	112	168
Total:			
Alumina	468	580	580
Aluminum	202	262	318
Mitsubishi Chemical Co., Ltd:			
Naoetsu (aluminum)	155	155	155
Sakaide (aluminum)	--	45	160
Total aluminum	155	200	315
Mitsui Aluminum Co., Ltd:			
Wakamatsu (alumina)	--	--	200
Omuta or Miike (aluminum)	8	38	75
Total:			
Alumina	--	--	200
Aluminum	8	38	75
Grand total:			
Alumina	1,343	1,700	2,200
Aluminum	781	1,139	1,453

[1] Apr. 1, 1970, to Mar. 31, 1971.

The aluminum industry expansion program continued to move ahead. Equipment investments during FY 1971 were expected to total 93.1 billion yen (about $280 million), a drop of 19.3 billion yen from FY 1970. Of the total, 73.8 billion yen was for aluminum refining, down 17.5 billion yen from fiscal 1970, and 19.3 billion yen was for rolled products, down 1.8 billion yen from fiscal 1970.

Japan's aluminum industry projected a total output of 1.104 million tons of metal in fiscal 1972, including imports from New Zealand produced by Showa Denko Co., Ltd. Breakdown by refiners was as follows, in metric tons: Nippon Light Metal Co., Ltd., 300,000; Showa Denko, 235,000; Sumitomo Chemical Co., Ltd., 270,000; Mitsubishi Chemical Co., Ltd., 224,000; and Mitsui Aluminum Co., Ltd., 75,000. Downward revisions were likely since Japan's aluminum demand increase during fiscal 1971 may only be 10 to 15 percent.

At yearend 1971, the industry was in distress in contrast to the outlook a year earlier when the hope was to raise annual primary aluminum capacity to about 2 million metric tons by 1975. The subsequent economic pinch exposed weaknesses within the industry that mitigated against expanding as much as originally planned. This was reflected by revised targets showing that Japan's primary aluminum capacity in 1975 may be closer to 1.5 million tons. Power and land costs have risen and the pollution problem is more expensive to cope with. The immediate effect was to delay construction of new facilities and shut down older and smaller facilities. While long-term demand was expected to grow steadily at a possible minimum of 10 percent per year, early in 1972 the trend was to shift some of the emphasis in building new plants to overseas.

Japan's most important overseas smelter project to date is a joint venture plant at Bluff, New Zealand. Showa Denko and Sumitomo Chemical each has one-fourth of the shares and Comalco Co., Ltd., has the rest. By mid-1971, annual aluminum capacity of this plant was 73,000 tons, to be expanded to 110,000 tons in 1972. With raw materials coming from Australia, the Japanese feel that capacity of the Bluff smelter can be expanded to as much as 300,000 tons or more as needed. Another project is a 50,000-ton (first stage) reduction plant to be built in Okinawa jointly by the five existing Japanese primary aluminum producers, each with a fifth of the shares. Reportedly to come on stream in 1974, the Okinawa plant can eventually be expanded to 200,000 tons. Nippon Light Metal, Showa Denko, and Sumitomo Chemical have also been looking into the possibility of constructing smelters on Bintan Island, Indonesia, and in the Asahan district of North Sumatra. Early in 1971, Mitsubishi Chemical was considering building a 50,000-ton (first stage) aluminum reduction plant in Singapore, with possibly Alcoa Co., Ltd., as a partner.

Meanwhile, raw material requirements continued to increase. Bauxite imports were 27 percent higher than in 1970, reaching about 4.67 million metric tons in 1971. Australia, Indonesia, and Malaysia were the main bauxite suppliers, with Australia also furnishing significant quantities of alumina. Additional bauxite will be needed because two new alumina plants—the Tomokomai Works (Hokkaido) of Nippon Light Metal and the Wakamatsu (or Hibikinada) Works of Mitsui Aluminum—were scheduled to commence operations during 1972–73. To assure long-term bauxite supplies, the five Japanese primary aluminum producers jointly formed the Aluminum Resource Development Co. (ARDECO) which undertook as its first project a survey in Ghana in January. ARDECO was asked in October to help develop a large bauxite deposit on Samar Island, the Philippines, and to construct an alumina plant there also.

In 1971 four Japanese firms, including two aluminum companies—Sumitomo Chemical and Showa Denko—agreed to a joint venture with American Metal Climax, Inc. (AMAX) of the United States to construct a 1.2 million-ton alumina plant at Kimberly, Western Australia. The plant will eventually supply 450,000 tons of alumina per year. In the short-term, Japan will produce a surplus of alumina hoping that some can be exported to compensate for losses in markets for smelter products. Nippon Light Metal, Showa Denko, and Sumitomo Chemical contracted in June with Ataka & Co. to export about 170,000 tons of alumina to the Soviet Union for the remainder of 1971 and hope to negotiate another 150,000 tons for 1972.

Nippon Light Metal, an affiliate of Alcan Aluminium Ltd., planned to reduce production during the October 1, 1971, to March 31, 1972, period to 125,000 metric tons, nearly 20 percent below original plans. Output during April 1972 to March 1973 would be reduced 12.3 percent below the original plan. Startup of the Tomakomai Alumina Works will be delayed, and startup of a completed new section of the company's Niigata plant was postponed to late 1972. Other companies were making similar adjustments.

Sumitomo Chemical shut down the small No. 1 plant at its Kikumoto Works, delayed construction of a large unit at the Toyama Works, and temporarily suspended operation of its 1,500-ton (18,000- to 32,500-ampere cells) high-purity aluminum plant, also at Kikumoto. Showa Denko also planned to shut down its small No. 2 plant at the Kitakata Works in April 1972. The No. 2 Chiba reduction plant was working at only half capacity in the fall of 1971. Showa Denko and Sumitomo Chemical had to accept delivery of some aluminum from its joint venture in New Zealand despite the projected oversupply of this metal.

Mitsubishi Chemical delayed expansion of its new Sakaide Works, which would use petroleum as fuel for power. Mitsui Aluminum was moving ahead with both its alumina and aluminum projects. Capacity of the Omuta or Miike Works will be expanded to 75,000 tons of ingot early in 1972 and to 150,000 tons by 1975. Mitsui Aluminum decided in January 1972 to build a new coal-burning powerplant for its latest aluminum expansion program to utilize locally available coal from a sister company.

Chromium.—Only small quantities of low-grade chromite were produced and industrial requirements for high-grade chromite were supplied by imports during 1971. Imports, mainly of high-grade metallurgical chromite, have averaged nearly 1.2 million metric tons annually in the last 2 years. More than half of the imports have come from the Republic of South Africa, with the rest imported mainly from India, the Philippines, the U.S.S.R., and Iran. Much of the chromite is converted to ferrochrome, as indicated by the 361,524 metric tons produced during 1970. The country also has a fairly sophisticated chrome metal industry, which produced 2,082 tons of refined chrome metal in 1971 as compared with 1,596 tons in 1970.

Japan has made continual efforts to secure more chrome ore from foreign countries. Near the turn of the year, a delegation of Japanese experts was sent to the Philippines to negotiate with Acoje Mining Co., Inc., to expand production. Technical and financial assistance was offered in the hope that annual supplies to Japan can be increased to more than 200,000 tons.

At yearend 1971, an agreement was about to be signed between the Brazil Chrome Deposits Development Co.—a Japanese consortium consisting of Nippon Kokan Co., Showa Denko, Nippon Denko, Japan Metals & Chemicals, Nippon Chemical Industries, Awamura Kogyo, Mitsui & Co., and Sumitomo Shoji—and the Brazilian firm Cia. de Ferro Ligas de Bahia S.A. (Ferro Bassa Co.) to develop the latter's chrome properties. The Japanese will own 51 percent of the joint venture and are hoping to start production in 1972. The initial objective was to produce 17,000 tons per year, but reserves may be able to support a much larger output.

Despite the long haul by sea, Japan Metals & Chemicals, the country's largest ferrochrome producer, concluded a long-term contract in the spring of 1971 with Etibank, the Turkish state-owned financing and mining corporation, for 100,000 tons per year of chromite over an 11-year period commencing in 1972. Etibank operates chrome mines at Sark Kromlari and Uçköprü in southern Turkey. The Japanese in turn will design, engineer, and construct a 25,000-ton-per-year high-carbon ferrochrome plant for completion by yearend 1973.

Copper.—Demand for refined copper has grown sharply, approximately tripling in the past decade and propelling Japan to third place as a world copper consumer. Japanese industry and government officials were forecasting a national demand of 1.25 million metric tons for 1975, up more than two-fifths over the 1971 tonnage. The above 1975 figure was at least 10 percent lower than earlier estimates, reflecting the repercussions brought about by the upward evaluation of the yen. Production in 1971, however, showed little change from 1970, in terms of both mine and refined metal. Nonetheless, the copper industry was obviously hurting late in 1971, with output lower because of slackening demand, raw materials accumulating at mines and ports throughout the world, stocks of metal and products unable to move, and construction of new facilities slowed down. Officials of the Japanese copper industry felt that losses might run up to $75 million to $80 million. Accordingly, Government aid was requested, and it seemed at yearend that MITI would extend aid. The upward trend in Japan's copper requirements is unmistakable. The MITI white paper on Resources, published in October 1971, forecasts that the country would need about 2.2 million tons of copper by 1980.

As of July 1971 copper smelters and refineries in Japan had annual capacities of 960,000 and 877,000 metric tons, respectively. Breakdown by company and facility in thousand metric tons is as follows: [6]

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[6] Engineering and Mining Journal (New York). Copper—Japan's Largest Metal Import. V. 172, No. 11, November 1971, pp. 105–110.

Company and plant	Capacity	
	Smelting by process	Refining [1]
Nippon Mining Co., Ltd.:		
Saganoseki	132 (flash)	168
Hitachi	72 (blast)	72
Mitsubishi Metal Corp.:		
Naoshima old	67 (fluosolids)	--
Naoshima new	101 (fluosolids)	96
Osaka	--	84
Sumitomo Metal Mining Co., Ltd.:		
Kunitomi	12 (blast)	--
Toyo	96 (flash)	--
Shisakajima	60 (blast)	--
Besshi or Niihama	--	144
Mitsui Mining & Smelting Co., Ltd.:		
Hibi	48 (blast)	--
Takehara	--	84
Dowa Mining Co., Ltd.:		
Kosaka	41 (flash)	42
Okayama	12 (blast)	11
Furukawa Mining Co., Ltd.: Ashio	48 (flash)	--
Furukawa Electric Co., Ltd.: Nikko	--	42
Toho Zinc Co., Ltd.: Onahama	18 (blast)	14
Onahama Smelting & Refining Co., Ltd.: [2] Onahama	144 (green charge reverberatory)	120
Rasa Industries: Miyako	24 (blast)	--
Hibi Smelting Co., Ltd.: Tamano	84 (flash)	NA

NA Not available; under construction.

[1] Electrolytic.

[2] Owned by Mitsubishi Metal Corp. (48.3 percent); Dowa Mining (25 percent); Furukawa Enterprises (10 percent); Mitsui Mining & Smelting (6.66 percent); others (10.4 percent).

To meet the smelting requirements dictated by the increased receipt of copper concentrates, the copper industry has been carrying out both short-range and long-range expansion programs. New startups scheduled for 1972 include a 48,000-ton-per-year Flash process smelter and an electrolytic refinery by Nippon Mining at Hitachi and an 84,000-ton refinery by Hibi Smelting at Tamano. This would bring Japan's copper refining capacity to more than 1 million metric tons per year. Japan has also strengthened its position as the world's largest custom smelter of copper. During 1971, U.S. producers shipped considerable copper concentrates to Japan for smelting on a toll basis, partly because of U.S. air pollution restrictions. Mitsubishi Metal Corp. announced that it had perfected a continuous copper smelting process without air pollution that could revolutionize copper technology because of the low costs. Mitsubishi's process is based upon the carefully controlled and simultaneous operation of three connecting furnaces—smelting, slagging (to produce white metal), and metal production.

Japan's indigenous copper mining industry, though providing only a small proportion of the concentrates smelted, continued to be of some consequence. Mitsubishi Metal Corp. built up its Shimokawa mine in the Kamikawa district of Hokkaido to 28,500 tons of 2.4 percent copper ore per day and its reserves to 5 million tons. Thus, Shimokawa became the third largest copper mine in Japan, after Dowa Mining Co.'s Hanaoka and Uchinotai "black ore" mines in northern Honshu. Hanaoka's Matsumine ore body has 30 million tons of ore containing 2.5 percent copper, 1 percent lead, and 4 percent zinc; annual extraction rate has been increased to one-half million tons of ore. The Uchinotai mine in the Kosaka area has proved reserves of about 10 million tons of ore, from which approximately 500,000 tons of ore and 12,000 tons of copper were produced in 1971. Both of Dowa's mines are worked by the underhand horizontal slicing system with an artificial roof, a method developed to accommodate conditions related to "black ore." The Shakanai mine of Nippon Mining, located near Hanaoka and also producing "black ore," yielded about 420,000 tons of ore of the same grade in 1971.

Since Japan produced 121,000 tons of copper-in-concentrates in 1971 compared with imports of approximately 1.93 million tons averaging more than 25 percent copper, the quest for overseas copper continued. The 1971 imports were nearly 400,000 tons more than the tonnage in 1970. In addition, there were landings of 282,000 tons of unwrought copper in 1971 and 313,000 tons in 1970. Breakdown for 1971 shows about 153,000 tons of refined copper

(91,000 tons from Zambia) and 115,000 tons of blister copper (44,000 tons from Zambia). Imports of copper scrap, a significant raw material for smelting, have not been large, indicating that substantial quantities of domestic scrap were utilized.

Japan's efforts to secure long-term supplies of copper concentrates from abroad have begun to bear fruit. In 1971 the country obtained about 250,000 tons of mine copper (copper-in-ores and concentrates) from already developed sources under long-term contracts and approximately 150,000 tons from so-called new mines and expansion projects. Supplies from existing sources are expected to decline somewhat as mines are worked out, whereas the supplementary tonnage from new projects is scheduled to rise sharply to possibly 650,000 tons. In addition, Japanese geologists and engineers are examining new deposits worldwide in the hope of finding adequate resources for the even more ambitious industrial programs that have been envisaged. Japan's estimated imports of mine copper, by country and importing company, are shown below, in thousands of metric tons:

Country, mine, and company [1]	1970	1971	1974	Japanese importer [2]
Australia:				
Mt. Lyell (Mt. Lyell)	10	17	17	Mb
Peko (Peko)	10	12	13	S
Ravensthorpe (Ravensthorpe)	5	10	10	Mi, Mb
Canada:				
Brenda (Noranda)	15	15	15	Mi, N
Craigmont (Craigmont)	30	30	--	N
Fox Lake (Sherritt Gordon)	--	15	15	Mb
Granduc (Newmont, ASARCO)	--	20	20	Mb, F
Granisle (Granby)	10	10	10	S, Mb
Highland Valley (Sumitomo, Bethlehem)	25	25	25	S
Ingerbelle (Similkameen, Newmont)	--	--	30	Mb
Lornex (Lornex)	--	--	45	S, N, D, Mi, Mb
New Imperial (New Imperial)	10	10	10	S
Port Hardy (Utah Construction)	--	--	55	Mi, Mb, D
Valley Copper (Cominco, Bethlehem)	--	--	88	S
Other	35	45	30	V
Chile:				
Rio Blanco (Andina)	--	35	40	S, Mb, Mi, N
Sagasca (Sagasca)	--	--	24	D, Mb, Mi
Other	5	5	--	V
Indonesia: Ertzberg (Freeport)	--	--	40	D, N, Mb
Malaysia: Mamut (OMRD)	--	--	40	V, F
Oceania: Bougainville (Rio Tinto)	--	--	95	V, F
Peru:				
Chapi (Chapi)	7	10	10	N, Mi
Condestable (Condestable)	5	7	7	N, Mi
Other	18	18	13	V
Philippines:				
Bagacay (Marinduque)	11	7	5	Mi
Lepanto (Lepanto)	13	15	15	
Marcopper (Marcopper)	34	43	45	N
Philex (Philex)	17	20	20	N
Sipalay (Marinduque)	22	21	20	Mi
Toledo (Atlas)	43	70	80	Mb
Other	10	10	15	V
United States	35	5	Small	V
Zaire: Musoshi (SODEMICO)	--	--	53	V, F
Other	30	25	15	V
Total	400	500	920	

[1] Short form of company names.

[2] V-Various or consortium of many companies; Mb-Mitsubishi; Mi-Mitsui; D-Dowa; S-Sumitomo; N-Nippon; F-Furukawa.

During 1971 the principal supplier of mine copper to Japan was the Philippines which furnished more than one-third of the total. Most of the increment of about 36,000 metric tons over 1970 was accounted for by the Atlas Consolidated Mining and Development Corp. which nearly doubled capacity to roughly 80,000 tons of mine copper. Marcopper Mining Co. was the only other Philippine firm furnishing Japan with considerably more copper than the year before.

Canada nearly caught up with the Philippines as the leading supplier of mine copper to Japan, as two large mines—Fox Lake and Granduc—commenced full-scale operations. At least four other even larger projects—Ingerbelle, Lornex, Port Hardy, and Valley Copper—were well underway and, when completed, will make Canada the largest supplier of copper to Japan. Sumitomo Metal Mining Co., Ltd. has played a vital role in promoting Canadian copper development.

The Bougainville project was ahead of schedule and ready to commence production by April 1972 at a capacity 10 percent higher than originally planned for. The project was running into contract difficulties at yearend because of economic dislocations in Japan. The Mamut operations in Malaysia and the Musoshi operations in Zaire (formerly Congo, Kinshasa), both controlled by a consortium of Japanese nonferrous mining companies, have scheduled their startup dates for late 1972.

An example of Japan's search for copper resources is Nippon Mining's exploration in the Asmara area of Ethiopia. Since signing a long-term concession agreement with the Government of Ethiopia near the turn of the year 1970–71, enough holes have been drilled to prove up several million tons of high-grade ore which could support a viable operation. More work will be done before a final decision is made on extraction plans.

Late in 1971 Mitsubishi interests reportedly signed an agreement with Consolidated Goldfields of Australia to develop the Gun Powder Copper Mine in northern Queensland. Putting up 30 percent of the 50 million Australian dollar capital, the Japanese would be entitled to the whole output of roughly 10,000 metric tons of mine copper per year.

Nippon Mining in association with the Australian firm Minju Pty., Ltd., was scheduled to prospect for copper and associated minerals in the Goroka district south of Madang in New Guinea. The little-known Japanese firm of Kokuba-Gumi was seeking authorization in mid-1971 to examine a potentially important copper prospect on Iriomote island in the Ryukyus. The Japanese nonferrous industry signed an agreement late in 1971 to assist the Peruvian Government in exploring for copper, lead, and zinc in the Yauri district of southern Peru. The quasi-Japanese-Government firm Overseas Mineral Resources Development Co., Ltd. (OMRDC) planned to send a team to Mexico hoping to develop a nonferrous mineral or fluorspar project.

Iron and Steel.—For the first time in nearly a decade Japan's crude steel output declined as compared with the previous year. The official 1971 production figure of 88.6 million metric tons was 4.7 million less than that of 1970. According to Tekko Shinbum (Steel News), however, actual output may have been 4 to 6 million tons higher, since most steel companies produced more than was reported during several months late in 1971 when the "anti-depression" steel cartel was not yet formed to temporarily limit production. Even prior to the United States new economic policy, the prolonged recession within Japan was already holding back steel consumption. The new economic policy aggravated the situation, forcing production cutbacks and also delaying construction schedules. Repercussions apparently went even farther, causing downward revisions of long-range objectives. No longer were the Japanese talking about producing 150 million tons by 1975 but rather 120 million tons or less. Nonetheless, the modern Japanese steel industry was strong at yearend 1971, projecting a quick recovery and expansion of output to a minimum of 95 million tons in fiscal year 1972. Although the upward evaluation of the yen meant that export sales receipts would be lower, raw materials would also be cheaper in view of the fact that much has been tied down long-term in dollars.

Japan remained in third place as a world steel producer, following the Soviet Union, with 120.0 million metric tons, and the United States, with 109.3 million tons. Japan also strengthened its position as the world's foremost steel exporter. Approximately 24.2 million metric tons of iron and steel products were exported in 1971, up a third over 1970 exports. Japan's 1971 steel exports had a value of 1.24 trillion yen.[7] Export contracts concluded in 1971 were slightly higher than actual shipments during the year, indicating that at least a reasonably productive year was in store for 1972. Pressures were mounting, however, in the United States and Western Europe to limit imports from Japan. Accordingly, the Japanese have made agreements to voluntarily control steel product exports to these areas.

With exports held down the Japanese were turning to domestic markets for new outlets. The lull in 1971 appeared temporary, with construction, machinery, automobile, and shipping businesses improving early in 1972 and public works projects being stepped up. Another factor which should raise production is that all the large steel companies were still trying to complete construction of their new steel complexes. At yearend 1971, more than one-third of Japan's 21 large, integrated steel complexes still had to be built up.

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[7] About $3.45 billion when converted at 360 yen =US$1.00 and $3.69 billion when considering the actual higher value of the yen.

Four Japanese steel companies were among the world's top 10 companies in 1971, headed by Nippon Steel Corp. with an output of about 30.4 million metric tons. This was roughly 6 million ahead of the output of United States Steel Corp. and British Steel Corp., the next two steel firms in rank, and nearly twice as much as the production of Bethlehem Steel Corp. Japan's Nippon Kokan Co. ranked fifth with 12.2 million tons, followed closely by West Germany's August Thyssen. Seventh and eighth in rank were Sumitomo Metal Industries Ltd. with 10.8 million tons and Kawasaki Steel Corp. with 10.5 million tons. Italy's Finsider enterprises and France's Wendel-Sidelor enterprises rounded out the first ten in rank, and Republic Steel Corp. ranked eleventh.

Japan has long had the world's largest blast furnaces, and establishing a record means topping the volume or tonnage of another Japanese furnace. The present Japanese and world leader is Nippon Kokan's Fukuyama No. 4 blown in April 26, 1971, followed by Nippon Steel's Kimitsu No. 3 blown in September 13, 1971, both capable of producing more than 10,000 metric tons daily. Most of the furnaces are in new steel complexes, which generally are designed for four big blast furnaces so that the degree of completion can be measured by the number of furnaces blown in. As of yearend 1971, Japan's 10 largest blast furnaces were as follows:

Company and blast furnace	*Cubic meters*
Nippon Kokan's Fukuyama Works No. 4	4,197
Nippon Steel's Kimitsu Works No. 3	4,063
Kawasaki Steel's Mizushima No. 3	3,367
Sumitomo Metal's Kashima Works No. 1	3,159
Nippon Kokan's Fukuyama Works No. 3	3,016
Nippon Steel's Nagoya No. 3	2,924
Nippon Steel's Kimitsu Works No. 2	2,884
Kawasaki Steel's Mizushima No. 2	2,857
Kobe Steel's Kagogawa Works No. 1	2,843
Nippon Steel's Kimitsu Works No. 1	2,705

As of yearend 1971, Japan already had the two largest steel complexes in the world—Nippon Kokan's Fukuyama Works with 12 million metric tons per year and Nippon Steel's Yawata Works (Tobata is a subsection) with 11 million metric tons per year. The Soviet Magnitogorsk Works came next, followed closely by Sumitomo Metal Industries' Wakayama Works at 9.5 million tons. August Thyssen's Duisberg-Hamborn Works was fifth at 9 million tons, and Bethlehem Steel's Sparrows Point Works sixth at 8.2 million tons. Nippon Steel's Kimitsu Works will join the 10-million-ton club in 1972. Nippon Steel also started to build its Tobata No. 4 blast furnace late in 1971, and when completed will elevate the Yawata Works to the number one position at 13 million tons. On November 2, 1971, Kawasaki Steel announced that it will start construction of the Mizushima No. 4 blast furnace and, when it is completed in April 1973, it will be the largest blast furnace in the world at 4,300 cubic meters; the Mizushima Works will also top 10 million tons of steel yearly, by a wide margin at that time.

On December 31, 1971, 58 blast furnaces were in operation. Four new furnaces were blown in: Nippon Kokan's Fukuyama No. 4 (4,197 cubic meters) in April; Nippon Steel's Kimitsu No. 3 (4,063 cubic meters) in September; Sumitomo's Kashima No. 1 (3,159 cubic meters) in January; and Nippon Steel's Yawata Kukioka No. 4 (1,540 cubic meters) in October. One way to cut production was to advance repair schedules of blast furnaces, some of which might be shut down permanently. Blast furnaces taken out of blast, all during the last quarter of 1971, were as follows: Nippon Kokan's 992-, 903-, and 620-cubic-meter furnaces at the Keihin Works; Sumitomo's Wakayama No. 3 (1,672 cubic meters); Kawasaki Steel's Chiba No. 4 (1,663 cubic meters); Nippon Steel's 934-cubic-meter furnace at Yawata; and Nippon Steel's 1,126-cubic-meter furnace at Muroran. Nippon Steel also planned to shut down two other furnaces of 892 and 1,273 cubic meters at Yawata early in 1972.

Despite the need to reduce output, the pressure to continue construction of unfinished steel complexes remained strong. After reviewing the situation, MITI's decided to urge industry to slow down and to assure that an older blast furnace would be shut down when a new one is completed. Approval of new expansion projects would be contingent upon this. Kawasaki Steel decided to curtail new plant investments in fiscal year 1972. For the steel industry as a whole, MITI estimated that investments in fiscal year 1972 would total about 690 billion yen as compared with about 840 billion yen in fiscal year 1971.

In conjunction with producing a reported 88.6 million metric tons of crude steel in 1971, Japan also produced 72.7 million tons of pig iron and 65.2 million tons of hot rolled ordinary steel. The high ratio of pig iron to steel shows the importance of iron ore and large blast furnaces to the industry. Breakdown of Japan's crude steel output in 1971 was as follows in million metric tons: Basic oxygen furnace (BOF), 70.9; electric furnace, 15.6; and open hearth furnace, 2.1. When Kobe Steel shut down its last two open hearths in January 1971, steel output by the five major companies became 100 percent by BOF's or Linz-Donawitz (LD) oxygen converters.

Nippon Steel typifies the industry in terms of technology. Replacement of older blast furnaces by new ones and steady improvement in existing operations have resulted in a continual reduction of the coke ratio. Nine of Nippon Steel's 24 blast furnaces early in 1971 had a coke ratio of less than 400 kilograms of coke per metric ton of pig iron. The record was held by the No. 2 blast furnace of the Muroran Works with 366 kilograms of coke (compared with 430 kilograms for the company); 93 kilograms of heavy fuel oil were also used, however, because of fuel injection practices. An outstanding achievement in research in 1971 was the development of a process to substitute synthetic flux for fluorspar in steelmaking.

Nippon Steel's Oita Works, about to come on stream, will be a showcase of Japanese steelmaking prowess. Continuous casting will be employed with projected output of 10.8 million metric tons of "conticast" slabs by 1975. The first blast furnace (4,158 cubic meters) was scheduled to be kindled on April 19, 1972; and the second one of about the same size will be started in July 1972. There will be two corresponding 300-ton BOF's to provide molten steel for slabs of up to 2,000 by 300 millimeters in size, plus complementary conventional mills. Nuclear energy will be used. The two blast furnaces and BOF's constitute approximately one-half the ultimate capacity of the steelworks. In order to use less than two man-hours per ton of steel, the Oita Works will be nearly a "manless operation," according to the President of Nippon Steel. On the average, both the Japanese and U.S. steel industries employ considerably more than 10 man-hours per ton of steel. Oita Works already has a 620-meter sea berth connected to land by a 400-meter bridge, capable of handling several 300,000-dead-weight-ton (dwt) carriers simultaneously.

The importance of exports is such that approximately one-third of the output of steel products in 1971 and one-fourth of those in 1970 were exported. Japan's exports of steel products in 1971 were 6.2 million tons more than the 18.0 million tons registered in 1970. The United States was still by far the most important single recipient country receiving a total of 6.1 million tons. Next came the People's Republic of China, with Japanese steel exports at 1.93 million tons, an increase of 0.36 million tons over the 1970 tonnage. Regionally, Asia accounted for 8.407 million tons, up 41.8 percent; North America 7.326 million tons, up 12.1 percent; Europe 3.543 million tons, up 28.1 percent; South America 2.455 million tons, up 86.8 percent; Africa 1.171 million, up 41.1 percent; and Oceania 0.989 million, up 63.1 percent compared with 1970 figures.[8]

Growth in Japanese steel exports to the United States has been slowed in recent years, with an increase of less than 200,000 tons or 3 percent in 1971. To stabilize mutually beneficial trade relationships, the Japanese Iron and Steel Federation reached a general agreement with the United States Government late in January 1972 to limit steel exports during a 3-year span beginning 1972 to an annual increase of 2.5 percent. The Japanese were also negotiating a similar agreement with the European Economic Community (EEC) countries.

Basic to the steel production and export program was the matter of raw materials from abroad. The economics of Japanese steel practice is such that imported scrap is not particularly important compared with primary iron materials. In 1971, Japan imported about 115 million metric tons of iron ore, 13 million tons more than in 1970. The long-term iron ore contracts already arranged as of mid-1971 were tabulated in the November issue of Engineering and Mining Journal. Australia will supply 35 to 40 million tons per year during the next decade; South America, 15 to 20 million tons; India, 10 to 15 million tons; Africa, 7 to 10 million tons; and Southeast Asia and North America, about 5 million tons each.

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[8] Japan Metal Bulletin (Osaka). Jan. 22, 1972, p. 3.

The search for new iron ore sources continued, so as to replenish depleted deposits and meet future Japanese demands. The trend has been to import higher grade and better conditioned primary iron materials, with a view towards facilitating transportation and smelting. One recent development pertains to the Robe River project in Australia where 87 million tons of high-iron-content pellets requiring a different kind of smelting have been contracted for shipment to Japan over a 21-year span beginning in 1972. Japanese steel companies made a commitment in 1971 to help develop the Aguas Claras Mine in Brazil for a maximum of 10 million tons of iron ore annually, starting in 1973. Early in 1972 the Brazilians made a proposition to Nippon Steel for aid in developing vast iron resources in the Amazon River Basin and simultaneously building a large integrated steelworks. Two events in Africa may be significant to Japan's future iron supply. The Japanese with the help of the leading U.S. and European steel companies moved ahead in the investigation and development of extensive iron resources in Gabon. Kawaski Steel heading a consortium of Japanese companies were moving ahead in a program to appraise the potential of the Wologisi Range in Liberia. Considerable exploration has taken place and transport facilities were being investigated. If this Liberian project were implemented, the Japanese would receive half of the output.

Lead and Zinc.—After a decade of rapid growth during the 1960's, Japan's production of slab zinc declined in 1970, primarily because two large plants—Toho Zinc's Annaka and Nippon Mining's Mikkaichi—had to decrease their output by about 40 percent because of public reaction to alleged pollution by sulfur dioxide and cadmium. Despite economic difficulties, zinc output in 1971 returned approximately to the level of 712,000 metric tons attained in 1969, after the two large plants previously mentioned adopted corrective measures and were allowed to operate at capacity. A monthly production record was established for Japan in October 1971, despite sluggish zinc demand at yearend. Overall zinc consumption showed no great change during 1969–71, after a decade of rapid advancement. Long-range, Japan's demand for zinc should rise steadily for the remainder of the 1970's.

Unlike most other minerals, Japan's zinc output from indigenous ores has been significant in total supply. As a result of the fairly recent discovery and development of the "black ores" (see under Copper) in northern Honshu, mine zinc output has been rising at about 10,000 tons yearly to 297,000 metric tons in 1971.

Foreign zinc raw materials still provide the mainstay in Japan's overall supply. Zinc concentrate imports were 972,913 metric tons in 1970 and 1,075,660 tons in 1971. Converting on the basis of 53 percent zinc in concentrates, imports by Japan were thus roughly twice domestic production. Canada and Peru were the two foremost suppliers, together furnishing about two-thirds of the total. Australia was next, but Mexico was catching up. Japan's plans to secure additional large tonnages of zinc worldwide are similar to the effort in copper. Also, imports of zinc metal were not noteworthy—some 22,000 tons in 1970 and 14,000 tons in 1971.

Related to zinc and the "black ores," Japan's mine output of lead has also been rising, reaching about 65,000 tons annually in recent years. This compares with imports of lead concentrates of 210,157 metric tons in 1970 and 225,427 tons in 1971. Lead concentrates usually contain 60 to 70 percent lead. Canada has supplied 60 to 70 percent of the concentrates, followed by Peru and Australia. Imports of refined lead and scrap have been small—on the order of 3,500 to 5,000 tons per year.

Japanese zinc and lead smelting facilities, particularly those pertaining to zinc, are large and modern by world standards. The two Imperial Smelting Process (ISP) smelters in existence were operating on balanced feeds of domestic black ores and imported concentrates. At yearend 1971, three zinc smelters were rated at more than 100,000 tons and six others at between 55,000 and 90,000 tons per year. One of the latter will be expanded to above 100,000 tons in the near future. Several zinc reflux refining plants for producing very high-grade zinc for diecast alloys were in existence. Lead smelters were not quite as modern and smaller. In recent years, the Japanese have been using the joint venture approach to increase lead-zinc smelter capacity. Japan's lead-zinc smelters, with their yearend 1971 annual capacities, are listed below, in thousand metric tons:

Company and plant	Lead	Zinc
Akita Zinc Co., Ltd.: Iijima	--	78
Hachinohe Refining Co., Ltd.: Hachinohe	30	72
Mitsubishi Cominco Smelting Co., Ltd.: Naoshima	36	--
Mitsubishi Metal Corporation:		
Akita	--	[1] 90
Hosokura	20	22
Mitsui Mining and Smelting Co., Ltd.:		
Hikoshima	--	60
Kamioka	40	60
Miike	--	[2] 136
Takehara	[3] 30	--
Nippon Mining Co., Ltd.:		
Mikkaichi	--	120
Saganoseki	36	--
Nisso Smelting Co., Ltd.: Aizu	5	30
Sumiko Imperial Smelting Process Co., Ltd.: Harima	24	55
Sumitomo Metal Mining Co., Ltd.: Kumitomi	20	--
Toho Zinc Co., Ltd.:		
Annaka	--	204
Chigirishima	54	---
Total	295	927

[1] Has 24,000-ton annual capacity for zinc diecast alloys.

[2] 114,000 tons of vertical retort capacity and 22,000 tons of electrolytic refining capacity. Also, a 40,000-ton-per year zinc reflux refining plant.

[3] Refines bullion from the Hachinohe smelter.

The zinc smelter at Iijima, a joint venture of Akita Zinc and Dowa Mining with the latter holding 52 percent of the shares, announced that it would start operations by January 1972. The first-stage production target of 6,500 metric tons of electrolytic zinc per month would be attained by July, and then move on to the final target of 10,000 tons per month. The first-stage plant costs $28 million, and the second-stage plant $14 million. Smelter feed will be 18,000 tons monthly of "black ore" concentrate from Akita Prefecture and 4,000 tons monthly of foreign concentrate. Dowa Mining was scheduled to furnish most of the zinc concentrate initially, diverting the supply that had formerly been going to its Kosaka Works, scheduled to be closed down near yearend 1971. Kosaka workers were also scheduled for transfer to Iijima.

Nippon Mining made further adjustments at its 120,000-ton Mikkaichi zinc smelter, in addition to measures taken to cope with pollution. The sintering operation at the Tsuruga unit was being replaced by a $2.2 million pelletizing plant scheduled to be on stream by 1972. A 72,000-ton redistillation plant using the New Jersey Zinc Co. process to produce high-grade zinc and a vacuum distillation plant for recovering cadmium have been added. Nippon Mining's Saganoseki lead blast furnace plant and electrolytic refinery operated on ores from Bolivia, Peru, Korea, and Australia.

Another new lead-zinc plant is an ISP smelter located at Hachinohe, a joint venture headed by Mitsui Mining and Smelting with 50-percent interest. Imported technology was improved upon, and $2 million worth of pollution control equipment was added. By expanding the furnace bottom, output of zinc was raised 50 percent to more than 6,000 tons per month; oxygen feed was being investigated with the view to further increase capacity. Improvements were also made to reduce shutdown time. Lead capacity remained at about 2,500 tons per month. The other ISP plant at Harima, operated by Sumitomo Metal Mining's wholly owned subsidiary Sumiko ISP Co., was not quite as successful, attaining monthly levels of 2,000 tons of lead and 4,600 tons of zinc.

Mitsui Mining and Smelting, owner of Japan's premium zinc-lead mine Kamioka as well as two large smelters at Kamioka and Miike, was negotiating a long-term custom smelting contract with Texas Gulf Sulphur Co. for zinc concentrates. The surplus smelting capacity in Japan and the closure of some zinc smelters in the United States for pollution reasons prompted this suggestion by Mitsui.

Manganese.—Virtually all of Japan's requirements for high-grade manganese ore and concentrates have been met by imports, although several hundred thousand tons of low-grade manganese ore are produced annually. In 1971, imports of high-grade, mostly metallurgical ore were approximately 1.5 million metric tons, with Australia supplying about 40 percent and the Republic of South Africa 30 percent. During the year, various actual and potential suppliers of manganese ore were planning to expand operations or develop production, including Groote Eylandt Mining Co., Pty., Ltd. of Australia, Longreach Manganese Pty., Ltd. at Ripon Hills in Western Australia, South African Manganese Ltd. at Wessels in Cape Province, Compagnie Minière de l'Ogooue (COMILOG) of Gabon, and the Tambao project in Upper Volta.

In 1971, Japan also imported more than 1.5 million metric tons of ferruginous manganese ore which has a low manganese content and is charged directly into blast furnaces rather than being made into ferroalloys. India and the Republic of South Africa furnished nearly all of the imports.

In recent years, Japan has been producing 350,000 to 400,000 metric tons of ferromanganese and 200,000 to 300,000 tons of silicomanganese per year. Exports are no longer important, and production is related to the needs of the steel industry which directly or indirectly produces most ferroalloys.

Japan ranked second to the United States as an electrolytic manganese producer, with an output of 9,965 metric tons in 1971. The largest Japanese producer has been Tekkosha Co. which completed a second 6,000-ton-per-year plant in Hyuga, Miyagi Prefecture, during the year to complement its older facility at Yamagata. The new plant cost $7.5 million and involved a 11,000-kilowatt power station. A significant proportion of Tekkosha's manganese metal output was exported to Western Europe.

Japan has also been important in electrolytic manganese dioxide, producing 42,197 metric tons in 1971. Tekkosha was again prominent. However, Mitsui officials were considering the investment of $7 million in a 10,000-ton-per-year manganese dioxide plant at Cork, Ireland. The firm feels that output could replace the 10,000 tons now exported yearly from Japan to Europe, and transportation costs would be cut radically.

Molybdenum.—During 1970–71, Japan produced less than 500 metric tons of molybdenum concentrates per year, as compared with roughly 15,000 tons of imports. Most of the foreign supply came from the United States and secondarily from Canada and Chile. The concentrates were made into other products by the Japanese before final use. In 1970, Japan produced 3,152 tons of ferromolybdenum and 285 tons of high-purity metallic molybdenum, and in 1971, 188 tons of molybdenum.

The Japan Molybdenum Co., a joint venture of AMAX and 10 Japanese ferromolybdenum producers, planned to start construction of 9,000-ton-per-year molybdenum trioxide plant at Ishinomaki, Miyaki Prefecture. The $5.5 million plant is to be completed in 1975, and AMAX reportedly will invest $4 million. Herreshoff furnaces will be installed.

Nickel.—For lack of resources, Japan imports all its nickel needs. During 1971, 9,356 metric tons of nickel metal (4,054 tons from the U.S.S.R.), 4.90 million tons of 1.8 to 2.5 percent nickel ore (3.95 million from New Caledonia and 0.82 million from Indonesia), 15,756 tons of nickel matte (10,403 tons from Canada), and nearly 1,000 tons of nickel scrap were imported. From these raw materials, Japan produced 15,492 tons of nickel and 286,290 tons of ferronickel in 1971. Japanese nickel producers and their monthly capacities are shown below, in metric tons of contained nickel:[9]

Company	Plant	Capacity (tons per month)
Sumitomo Metal Mining Co. Ltd	Hyuga (Hosojima)	2,200 (ferronickel)
	Niihama	1,000 (nickel)
Shimura Kako Co	Muroran	500 (ferronickel)
	Amagasaki (Itami)	500 (nickel)
Taiheiyo Metal Mining Co	Shibata	1,000 (ferronickel)
	Hachinohe	2,000 (ferronickel)
Nippon Mining Co	Saganoseki	1,500 (ferronickel)
Nippon Yakin Kogyo Co	Oeyama	1,000 (ferronickel)
Nippon Nickel Co	Unknown	420 (nickel oxide)
Tokyo Nickel Co	Matsusaka	660 (nickel oxide)

More than four-fifths of the nickel in Japan has been consumed in specialty steels. Generally speaking, nickel has been in short supply and prices are higher than elsewhere in the world. Construction of liquefied natural gas (LNG) tankers in the future apparently will require additional large tonnages of nickel. To assure adequate supplies, the Government assists nickel producers through the Nickel Smelting Industry Subsidy Temporary Act, exemption of taxes for smelters, and measures related to a tariff and allocation system.

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[9] Look Japan (Tokyo). Aluminum and Nickel Industry in Japan. Jan. 10, 1972, p. 21 and p. 24.

The 1971 economic recession and the upward reevaluation of the yen in the latter part of the year resulted in temporary cutbacks in ore importation and ferronickel production. The Japanese were talking about reducing ore imports during fiscal year 1972 from 4.5 million to 3.0 million tons for New Caledonia and from 0.8 million to 0.6 million tons for Indonesia. A one-fourth cut in ferronickel production was also contemplated. Taiheiyo Metal Mining deferred startups for some new facilities at its Hachinohe plant. Shimura Kako decided to postpone construction of a large ferroalloy plant at Niigata, in a joint venture with Nippon Mining. All the companies were taking measures to hold back production.

Japan was exploring and developing a number of nickel deposits in addition to regular purchase type of contracts. An agreement was signed with the Marinduque Mining and Industrial Co. of the Philippines to purchase 15,000 tons of nickel per year (and cobalt) from Nonoc Island in return for a nickel reduction plant made by Kobe Steel. Nippon Mining was in a joint venture in the Philippines to explore for nickel on Palawan Island. Sumitomo Metal Mining was exploring for nickel in Western Australia, and Mitsui Mining and Smelting, in a joint project with the Northman Gold Mine Pty., was also looking for nickel in Australia.

Among the Indonesian ventures, International Nickel Co. of Canada (INCO) was trying to interest a consortium of predominantly Japanese nickel companies to form a joint venture to exploit nickel in the Soloako area, Pomala district of Sulawesi Island (Celebes). INCO's nickeliferous laterite deposits are credited with initial reserves of 180 million tons of 1.7 to 1.9 percent nickel ore. The plan is to expand production in three stages—12,500 tons of contained nickel annually up until 1974, 25,000 tons until 1976, and 75,000 tons by 1978 or 1979. The optimum goal is 100,000 tons. INCO intends to produce nickel matte and eventually ferronickel and refined nickel in Indonesia. All of the output will go to Japan in the form of nickel matte during the middle 1970's. INCO also hopes to export nickel to the People's Republic of China via Japan after the latter has converted matte to nickel products.

Indonesia's state-owned Anekatanban Co. requested the Japanese Government to participate in a ferronickel project using Sulawesi ores.[10] Anekatanban plans to invest $26 million in a 20,000-kva electric furnace plant to produce 4,000 tons of contained nickel annually beginning in 1974. The Japanese Government, which will send a six-man survey team, has been asked to provide $13 million in the form of a yen loan. In addition to securing future supplies, the Japanese are interested in this project in the hope of breaking INCO's monopoly.

Titanium.—Japan's titanium industry, third largest in the world, was in the doldrums in 1971, although capacity was significantly raised early in the year. The New Metals Industries Co. became the country's third sponge titanium producer, with a 180-ton-per-month plant employing a new single-step process utilizing metallic sodium rather the conventional two-step Kroll Process utilizing magnesium. Toho Titanium Co., Ltd. expanded capacity to 450 metric tons of sponge per month, matching the capacity of Osaka Titanium Co., Ltd.

Whereas Japan's overall capacity for making sponge was increased to 1,080 tons monthly, production was only 6,777 tons in 1971 as compared with 9,230 tons in 1970. Correspondingly, export shipments dropped from 4,300 to 2,714 tons, and domestic shipments dropped from 4,300 to 3,576 tons. Exports to the United States were particularly low in the last quarter of 1971. In fact, demand was so weak that the industry decided to cut production to only 300 tons monthly for the first half of 1972, anticipating no strong upturn until possibly 1973. Meanwhile costs have gone up sharply.

Kobe Steel Ltd. which produced most of Japan's ingot titanium was likewise having difficulties, although its problem was not as acute as that of sponge producers. The titania pigments industry, headed by Ishihara Sangyo Kaisha Ltd. and Sakai Chemical Industry Co., also encountered difficulties. Exports to the United States were nearly suspended between August 15 and yearend, and a large cut in output was expected early in 1972. For fiscal 1971, Japan was to have produced 165,000 metric tons of titanium dioxide and sold one-fourth to the United States.

The Japanese have made significant

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[10] Japan Metal Bulletin (Tokyo). Mar. 9, 1972, p. 5.

headway in the field of synthetic rutile, a preferred titanium raw material. Ishihara Sangyo reportedly perfected a chloride process in conjunction with titanium dioxide, and the technique was being furnished to the Indian Rare Earths Ltd. for a fee. Mitsubishi Chemical Industries Co., Ltd. entered into an agreement with the Australian firm Murphyores Holdings Ltd. to jointly undertake further research and development of the latter's "Murutile" process of converting ilmenite to synthetic rutile.

Tungsten.—Japan produced 730 metric tons of tungsten-in-concentrates and imported 3,390 tons in 1970. In 1971, output was down slightly, whereas imports declined sharply to possibly only 1,500 tons of contained tungsten. Recession in the steel industry was primarily responsible for the reduced demand. Normally, Japan would need to import 2,500 to 3,500 tons of contained tungsten annually or 4,000 to 6,000 tons of concentrates.

Japan produced 1,785 tons of refined tungsten metal and 1,278 tons of ferrotungsten during 1970. By 1971, output of refined tungsten dropped sharply to 1,176 tons. Awamura Mining was the leading producer of ferrotungsten as well as tungsten concentrates in the country. There were at least four tungsten metal producers—Tokyo Tungsten, Tokyo Shibaura, Nihon Tungsten, and the Mitsubishi Metal Corp.

Uranium.—The Atomic Energy Commission of Japan (JAEC) published a white paper on August 3, 1971, evaluating the future growth of nuclear power and the raw materials required. This forecast envisages growth up to 27 million kilowatts by fiscal 1980 and up to 60 million kilowatts by fiscal 1985. Late in 1971, four atomic powerplants with a total capacity of 1.3 million kilowatts were already in operation; nine units totaling 5.8 million kilowatts were scheduled for completion by yearend 1975.

Japan's cumulative requirement for nuclear fuel was forecast to reach 18,000 short tons of uranium oxide (U_3O_8) by 1975 and 120,000 tons by 1985. The overwhelming proportion of this supply would have to be imported, including large tonnages from Canada, Australia, the United States, and Africa. At the start of 1971, Japan's long-term contracts for uranium oxide aggregated only about 30,000 short tons, mainly from Canada's Denison Mines, Ltd., Rio Tinto Zinc Corp., and the U.S. Firm Kerr-McGee Corp. A worldwide search for uranium supplies has been started by a special council under JAEC that recommended the expenditure of about $150 million for uranium exploration during the decade beginning 1972.

As for enriched uranium, demand was forecast at 3,000 tons per year by 1975 and 8,000 tons per year by 1985. The white paper pointed out that the current enriched uranium capacity of the United States was about 17,000 tons per year, and only a portion of this supply was available to Japan. Reportedly, the Japanese were considering setting up a uranium enrichment plant in Australia for approximately $1.2 billion, for completion by 1980.

In early 1971, Japan's uranium reserves were on the order of 8,000 tons of U_3O_8. During the year, however, the quasi-government Atomic Fuel Development Corporation embarked upon an intensive exploration program to delineate reserves of high-grade ore from two newly discovered deposits—Joringi in Toki in the Gifu Prefecture and Toyota in the Yamaguchi Prefecture.

Other Metals.—Because of its large base metal smelting and refining capacity, Japan has been prominent internationally in the production or consumption of many other metals, including bismuth, cadmium, germanium, magnesium, mercury, rare earths, selenium, silicon, tantalum, tellurium, tin, vanadium, and zirconium.

Japan was the world's third largest consumer of tin in 1971, with imports furnishing more than 95 percent of requirements. Only two domestic mines were of any consequence, namely Ikuno and Akenobe, both belonging to Mitsubishi Metal Corporation. With the revaluation of the yen, Ikuno was scheduled to shut down in the near future. Tin imports, predominantly from Malaysia, during 1970 and 1971 averaged about 27,000 tons per annum. Japan's effort to smelt tin in Malaysia did not turn out successfully.

As in the past, Nomura Mining Co. was Japan's mainstay in mercury. It operated Itomuka, one of the few mercury mines in Japan which, however, may be permanently shut down soon. Nomura had a 10-year contract to import mercury concentrates from the Red Devil mine in Alaska before it shut down on account of low mercury prices. Much of Japan's 1971 output of 228 metric tons (one metric ton equals about 29 flasks) of refined mercury was extracted by Nomura. Japan's mercury imports in finished form were much larger than production, specifically 1,245 metric tons in 1970 and 519 tons in 1971.

Japan ranked second as a world cadmium producer during 1970–71, providing about 17 percent of the world total. About half of the approximately 2,500 metric tons extracted yearly was exported and these exports no doubt had an effect on world prices, which stood at roughly $4 per pound early in 1971, declined to $1.50 in the spring, and rose to $2.25 in February 1972. Although most exports went to Europe, U.S. authorities alleged that the Japanese were dumping cadmium. Seven Japanese zinc smelters established a cadmium export cartel in midyear to control shipments abroad and, in fact, curtailed cadmium exports to the United States during the last few months of 1971. With prices up again early in 1972, it became necessary for the Japanese cadmium producers to reexamine their export position.

Shin Nihon Chemical Industries Co., subsidiary of Asahi Chemical Industries Co., completed expansion of its sea water magnesia facilities to 200,000 tons per year, with the help of the United Kingdom firm Steeley Co., Ltd. Only Ube Chemical Industries Co. rated at 400,000 tons had a larger capacity than Shin Nihon. Japan's annual production level for magnesium metal is approximately 10,000 metric tons.

The Japanese also moved ahead in a program to start cobalt production by 1974. Nippon Mining plans to produce about 1,000 tons of cobalt per year at its Hitachi smelter, and Sumitomo Metal Mining intends to turn out 1,200 tons of cobalt per year at its Niihama refinery. Sumitomo will get its raw material from Marinduque Mining of the Philippines.

Japan's role as a producer of high-purity silicon and germanium, used primarily in electronics, is shown by the high production levels, specifically 159 metric tons of silicon, 19 tons of germanium, and 16.5 tons of germanium oxide during 1971.

Tantalum was another metal used extensively in electronics. Japan has had to supplement production with imports. During 1970–71, output of primary tantalum averaged about 20 tons per year as compared with some 17 tons of imports; an equal amount of scrap tantalum was imported. Shinetsu Chemical Industries Co. and Showa Denko K.K. were the leading refined tantalum producers. Late in 1971 Showa Denko applied with MITI for the establishment of a joint venture with the United States firm KBI Co. to produce tantalum and products on an integrated basis.[11] The plan is to turn over Showa Denko's 30-ton-per-year plant at Higashi Nagahara to the new company which will be called Japan KBI Co.

A consortium of four Japanese chemical and metal firms announced completion of facilities at Nippon Denko's Tokushima plant to produce 2.4 million pounds of vanadium pentoxide (V_2O_5) from South African steelmaking slag. The V_2O_5 is to be further processed into ferrovanadium.

Nippon Mining Co. and Sumitomo Metal Mining Co. agreed to form a joint company to produce zirconium sponge and billet.

The Japanese have been significant producers of rare earths. However, production must compete with imports whose position has been strengthened as a result of the upward revaluation of the yen. For lanthanum oxide, production dropped from 124 metric tons in 1970 to 95 tons in 1971. In April 1971, breakdown of demand in Japan for rare earths in the ensuing fiscal year was estimated as follows, in metric tons: Yttrium oxide, 16; europium oxide, 1; lanthanum oxide for optical glass, 120; lanthanum oxide for ceramic condensers, 60; cerium oxide for decolorizing glass, 60; cerium oxide for polishing plate glass, 150; cerium oxide for polishing Braun tubes, 200; cerium oxide for polishing optical glass, 120; mischmetal for making pyrophoric alloy, 120 tons; mischmetal for steel making, 100; fluoride rare earth for making arc carbon, 70; and fluoride rare earth for making steel, 80.[12]

NONMETALS

Cement.—Japan's cement output registered a 2.3-million ton gain over the 57.2 million metric tons produced in 1970. The country continued to rank third among world producers after the Soviet Union and the United States. Japan's cement-manufacturing capacity was raised 6.8 million metric tons in 1969 and another 7.3 million tons in 1970. Although this production capacity was further increased in 1971, the increment apparently was not as spectacular as in the previous 2 years.

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[11] Japan Metal Bulletin (Tokyo). Dec. 18, 1971, p. 5.

[12] Japan Metal Bulletin (Tokyo). Jan. 29, 1972, p. 5.

Japan has a modern cement industry with good pollution-control equipment and many of the world's largest plants. For example, Onada Cement Co.'s 3,300-metric-ton-per-day cement kiln in Ofunato, Iwate Prefecture, probably was the world's largest cement kiln at yearend 1971.

Japan's cement industry continued to be essentially domestically oriented, with annual exports not much more than 2 million metric tons. The economic recession slowed cement consumption slightly in 1971. To stimulate the economy, the Government started to step up public works construction in 1972—a program that undoubtedly would help the cement industry. This has led producers to anticipate a total demand of 100 million tons of cement by 1975. Although this forecast may be overly optimistic, the cement industry was clearly moving ahead on its program to further expand facilities.

Fertilizers.—Japan's chemical fertilizer industry ranking third in the world continued to expand, particularly in terms of large plants of 800- to 1,500-ton-per-day capacity. These plants were built by the major companies like Sumitomo Chemical, Mitsubishi Chemical, Showa Denko, Ube Industries, and Mitsui Toatsu Chemicals. During 1969–71 about 15 such plants were completed. Meanwhile, domestic demand and exports started to slow down in the latter part of 1970 and the end was not yet in sight by yearend 1971. This created an oversupply which necessitated cutting down Japan's plant operation ratio, perhaps permanent closure of some less efficient facilities, and drastic reduction of dividends and prices. Increased availability of sulfur from petroleum refining and nonferrous smelting for making ammonium sulfate further aggravated the crisis. The Japanese Ammonium Sulphate Industry Association, for example, decided to reduce output at urea plants to 75 percent of rated capacity during the year ending June 30, 1972, and, actually cut down production to about 50 percent in the second half of 1971.

Japan's fertilizer industry remained very much export-oriented, selling more than half of its output abroad. During fiscal year 1970 (April 1970 to March 1971), production and exports (in parentheses) of various chemical fertilizers were as follows, in thousands of metric tons: ammonium sulfate—2,234 (1,116); urea—2,646 (1,735); ammonium chloride—779 (592); compound fertilizers (potash and phosphate components mainly imported)—2,330 (180); and total of all ammoniacal fertilizers (measured in N or nitrogen content) —2,066 (1,206). For the first 11 months of 1971, Japan exported 1.64 million metric tons of urea valued at $84 million; 1.15 million tons of ammonium sulfate valued at $28 million; 0.58 million tons of ammonium chloride valued at $15 million; and perhaps 0.3 million tons of other chemical fertilizers valued at possibly $20 million.

By far the largest fertilizer export market is the People's Republic of China; during January–November 1971, 76 percent of Japan's urea exports, 67 percent of the ammonium sulfate, and 93 percent of the ammonium chloride went to China. Japan's 1971–72 (July to June) supply contract with China calls for the delivery of 1.75 million tons of urea, 650,000 tons of ammonium chloride, and 750,000 tons of ammonium sulfate.[13] The 1971–72 agreement meant a total of 1.125 million tons of N, as compared with 1.143 million tons during 1970–71.

There were, however, two significant factors which detracted from the desirability of the latest contract from the Japanese viewpoint. Firstly, prices were much lower than what the Japanese had hoped for, with reductions of about 10 percent for urea, ammonium sulfate, and ammonium chloride as compared with the previous contract. Secondly, the 1971–72 contract calls for the bulk of the contracted tonnage to be delivered during January to June 1972. This meant shutdown of plants and accumulation of stockpiles during the second half of 1971. Japan's principal competitor, NITREX of Europe, did even worse in the China market.

In contrast to adequate supplies of nitrogen and sulfur, Japan continued to be virtually totally dependent upon foreign sources for phosphates and potash. During 1970 and 1971, phosphate rock imports were just over 3 million tons per year, nearly two-thirds from the United States and about one-sixth from Morocco. Potash needs were roughly 1.3 million tons per year, approximately 40 percent from Canada and 10 to 15 percent each from the U.S.S.R., the United States, and Israel.

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[13] Nitrogen, (London). The British Sulfur Corp. Ltd. No. 74, November–December 1971, pp. 7–10.

Fluorspar.—Japan's output of fluorspar represented only about 2 percent of imports in 1971. However, consumption surpassed the half-million-ton mark for the third year in a row, reaching a level more than half the U.S. consumption. As in other industrial countries, most of the fluorspar went into steel smelting and aluminum reduction. A significant technical development took place in June 1971 that may affect future fluorspar consumption in Japan. Nippon Steel Corporation announced that it had developed a synthetic flux of lime, iron oxide, alumina, and silicic acid as a substitute for fluorspar in oxygen converter or BOF smelting.[14]

Meanwhile, the program to import increasing quantities of fluorspar was stepped up. Imports in 1970 were 520,800 metric tons valued at 7.73 billion yen ($21.5 million), half from Thailand and roughly 40 percent from the People's Republic of China and the Republic of South Africa. During 1971, imports soared to 677,950 metric tons valued at 12.9 billion yen, about 43 percent from Thailand, and one-third from the People's Republic of China and the Republic of South Africa. It should be noted that average prices rose from $41 per ton in 1970 to $53 in 1971. Also, Mexico, the largest fluorspar producer in the world, supplied only a small amount to Japan.

In September it was announced that Marubeni-Iida and Metallúrgica Mexicana Peñoles S.A. are to establish a joint aluminum fluoride plant at Torreon, close to a large fluorspar mine northwest of Mexico City.[15] The Japanese company with 40-percent interest in the $3 million project will initially import all the output. Shipments will commence early in 1974, for sale to Japanese aluminum refineries and later also to consumers in Western Europe. This project is supposed to eliminate Japanese shortages in aluminum fluoride by 1974.

To further diversify supply and cut import costs, the Japanese were also looking into Brazil as a source of fluorspar. The Brise Company of Brazil has requested the ARDECO of Japan to make a fuller assessment of its properties in the Santa Catarina district and to supply capital for the development of at least 1 million tons of high-grade fluorspar.

Sulfur.—Japan's sulfur supply picture has been undergoing basic changes in recent years. Output of sulfur from indigenous ores, both byproduct and elemental, continued to decline in 1971. Pyrite production was down slightly, although Japan maintained its position as one of the world's top producers. However, the drop in elemental sulfur production from native sulfur mines has been precipitous, falling from 204,000 metric tons in fiscal year 1969 (April 1969 to March 1970) to 109,000 tons in fiscal year 1970 and an estimated 45,000 tons in fiscal year 1971.

In view of the rapid expansion in petroleum refining and the public pressure to remove sulfur from crude oil, "recovered sulfur" production has been increasing at a significant rate—from an actual 270,000 tons in fiscal year 1970 to a projected 375,000 tons in fiscal year 1971, 600,000 tons in fiscal year 1972, and 710,000 tons in fiscal year 1973.

Since overall sulfur demand is on the order of 400,000 to 450,000 tons yearly, surpluses are imminent by 1972. The surplus would exceed 200,000 tons in fiscal year 1972 unless new outlets for sulfur are found. Accordingly, the Japanese are trying to promote the use of recovered sulfur in sulfuric acid manufacture and develop other new markets at home and abroad.

MINERAL FUELS

Coal.—The year 1971 showed no basic change in Japan's overall coal supply position, except that projected growth of future demand was toned down, in view of the depressed economy and stagnant condition of the steel industry at yearend. Expanded power and energy needs will be met by petroleum, atomic energy, and hydropower rather than by coal. The steel industry is expected to consume increasing quantities of coal but most of the requirements will be met by imports. The Japanese coal industry continued to shrink in 1971, with output down another 15 percent and additional mines such as Utashinai and Ponbatsu in Hokkaido belonging to Sumitomo Coal Co. shut down in October.

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[14] Nippon Steel News (Tokyo). No. 15, July 1971, p. 3.

[15] Mining Journal (London). V. 277, No. 7101, Sept. 24, 1971, p. 275.

Japan's 1971 coal supply consisted of 34 million metric tons of domestic coal and 47 million tons of foreign coal. About 22 million tons of domestic coal and less than 2 million tons of foreign coal were of the noncaking variety. Although MITI was not keen on seeing closure of more coal mines, the ones still in operation were facing severe competition from imported fuels. Even the best of all Japanese coal mines, the Miike of Mitsui Mining in Kyushu, was feeling the pressure. Fortunately for Miike, a sister company with an aluminum plant in the same locality, decided to use local coal for conversion into power for aluminum reduction needs in its expansion projects.

The indispensable need for coal continued to be in steel manufacture. Only about 10 to 12 million tons of domestic coal can be used for smelting but must be blended with imported high-grade coking coal before use because of its weak-caking properties. Adding this to the 47 million tons of imports in 1971, Japan's supply totaled approximately 58 million tons of coking coal. For every ton of steel produced, roughly two-thirds of a ton of coking coal is needed. To produce 120 million tons of steel annually a few years hence, Japan needs about 80 million tons of coking coal, of which 70 million must be imported. Improved coke to pig iron ratios in the future will mean a need for slightly less coal but more liquid fuel or nuclear energy, and this thinking is reflected in Japan's long-term coal import contracts.

In 1971, as in 1970, Japan's coal imports totaled about $1 billion in value, with coal quality, prices, and demand affecting sources of supply. U.S. coals continued to command sizable premiums because of their high quality (low-ash and low-volatile content) as compared with other coals; imports of 10 to 15 million tons per year was considered indispensable to Japan. Beyond this level, however, other factors come into play, such as delivered prices and demand in general. Coal imports from the United States were approximately 18.5 million metric tons (valued at $28 per ton), down 6.8 million from 1970. The forecast for fiscal year 1972 at 17 million tons is still lower.

Coal imports from Australia during 1971 were about 16.5 million tons valued at $15 per ton, nearly the same as the previous year. In fiscal year 1972, imports are expected to rise to 19 million tons. Canada's share jumped from 3.4 million in 1970 to 6.2 million in 1971, the latter being valued at $18 per ton. The projection for Canadian coal in fiscal year 1972 is 10 million tons. Thus, Australia and Canada were gaining ground at the expense of the United States, even though the coals are inferior. Early in 1972, Japan had long-term contracts with Australia and Canada to buy more than 200 million tons from each of these sources. Late in 1971, however, the Japanese became concerned with Canadian coals with regard to development cost and delivery schedules and canceled one of the big contracts already signed.

The realignment of world currencies, overall supply of coal, and recession in international shipping during 1971 created a confused state of affairs with regard to Japanese options in buying foreign coal. Although the upward evaluation of the yen should benefit Japan in the long-term dollar contracts, countries suffering these losses were pushing for price increases instead. Freight rates declined drastically, albeit temporarily, but Japan was unable to take advantage of this because of its own economic recession. Because of wage increases, U.S. east coast coal exporters successfully negotiated a price increase of about $1 per ton with Japanese steel producers.

The Australians were trying to get a similar increase of about $1 per ton, giving as their reason the upward evaluation of their currency also; however, Japanese steelmakers did not agree to this at yearend, fearing a precedent might be established which would affect all Australian contracts. The Canadians had already received $1- to $2.50-per-ton increases in several cases, to compensate for higher-than-anticipated development costs. The Japanese were in no mood to grant further increases and were considering canceling some contracts with the Canadians. Overall, scaling down future steel production targets has had an important bearing on many contracts.

In Australia, the Goonyella Coal Mine in Queensland and its railway and port facilities were opened on November 5, 1971. When Goonyella will be in full operation, it is scheduled to supply 4 million metric tons of coking coal per year to Japan. Another mine at nearby Peaks Downs was being developed for 3 million tons of coking coal yearly. Late in 1971, the Japanese also became interested in the development of the Salagy Coal Mine (also in Queensland) jointly with Utah Construction & Mining Co. for 4.5 million tons per year starting in 1974. Early in 1972, the Thiess Peabody Co. was negotiating a price increase of more than $1 per ton for coal from its South Black Water Mine which was providing 1.5 million tons of coal per year to Japan. The Clutha Development Pty., Ltd., of Australia, supplying 3 million tons of coking coal to Japan yearly, was also negotiating a price increase for its Wollondilly mine. The Japanese did not give in on coal price increases in Australia.

The Japanese were having trouble with various Canadian coal companies. An important development concerned the McIntyre Porcupine Mines, Ltd., owner of the Smoky River properties in Alberta. Despite granting price increases, McIntyre was a full year behind schedule in its 2-million-ton-per-year "first" long-term contract and had not made preparations to fulfill its 3.5-million-ton "second" long-term contract. This prompted Japan to cancel the "second" contract in October.

In the Republic of South Africa, a long-term contract was signed in 1971 with the Transvaal Coal Owners Association for the eventual delivery of about 3 million tons of "blend" coking coal per year from Witbank, beginning in 1976. In New Zealand, a contract was signed with the West Coast Resources for the delivery of 0.5 to 1 million tons of coking coal per year from the Mount Davy area, Graymouth district, beginning in 1974. Both contracts involve Japanese loans and assistance in mine development. During 1971 the Japanese were also investigating the possibility of developing coal mines in the Yakutsk district of Siberia.

Although the West Virginia region of the United States has long been the principal source of premium-grade coking coal to Japan, almost all past deals had been purchase contracts, long-term or spot. Late in 1970, however, an agreement was made between Nippon Steel Corp. and Island Creek Coal Co. to develop a new coking coal mine in Virginia whereby the Japanese would advance funds for mine development in return for future deliveries of 2 million tons of coal per year to Japan.

Petroleum.—In 1971 Japan strengthened its position as the world's third largest refiner and consumer of petroleum following the United States and the U.S.S.R. Measured in terms of primary atmospheric crude distillation facilities, refining capacity was increased by about 12 percent over that of 1970. Japan's refinery throughput during 1971 was some 1.4 billion barrels, roughly equivalent to crude oil imports and output of products. Breakdown of 1971 refined production is estimated as follows, in percent: fuel oil, 55; gas oil, 6; naphtha, 13; gasoline, 12; kerosine, 8; and others, 6.

At yearend 1971 Japan had 42 refineries owned by 27 companies, with a total atmospheric distillation capacity of 4,109,360 barrels per day (bpd). Corresponding downstream capacities were as follows: vacuum distillation, 1,066,700 bpd; catalytic cracking 231,600 bpd; catalytic reforming, 395,200 bpd; middle distillates hydrodesulfurization, 715,200 bpd; fuel oil desulfurization 465,260 bpd; hydrocracking, 12,500 bpd; lube oil solvent extraction, 49,660 bpd; lube oil solvent deasphalting, 42,040 bpd; sulfur recovery, 2,445 metric tons per day; and liquefied petroleum gas (LPG) recovery, 17,800 metric tons per day.[16] Each refinery had an atmospheric distillation unit. There were also 29 vacuum distillation units, 34 catalytic reforming units, and 14 catalytic cracking units.

The petroleum industry was still moving ahead on its expansion program despite the economic recession. Whereas the steel, automobile, and chemical industries were cutting down on their capital investments, the petroleum industry continued to build new facilities roughly according to plan. Investments planned for fiscal year 1971 totaled 405 billion yen as compared with 276 billion yen a year earlier. By yearend 1971 MITI had already approved the expansion plans of 21 refining companies which would add 1,943,000 bpd to Japan's primary atmospheric crude distillation capacity by October 1974. If carried out, Japan will have a total of 6,052,360 bpd of such capacity by that time, an increase of more than 47 percent in less than 3 years. Details of Japan's atmospheric crude distillation capacity, present and future, by company and refinery, are shown below in barrels per day (bpd):

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[16] Japan Petroleum Weekly (Tokyo). Japan Petroleum Consultants, Ltd. Jan. 17, 1972 and Jan. 24, 1972, pp. 13–14.

Company and refinery	Capacity, barrels per day		Completion date
	Yearend 1971	Planned	
Asia Sekiyu:			
Hakodate	25,000	---	---
Yokohama	100,000	---	---
Asia-Kyoseki: Sakaide	---	60,000	October 1972
	---	90,000	October 1974
Daikyo Sekiyu: Yokkaichi	195,000	20,000	October 1974
Fuji Kosan:			
Kainan	47,600	30,000	October 1972
Onahama	---	30,000	October 1974
Fuji Sekiyu: Sodegaura	140,000	70,000	October 1974
General Sekiyu:			
Kawasaki	55,000	---	---
Sakai	120,000	---	---
Idemitsu Kosan:			
Aichi	---	130,000	April 1974
Chiba	270,000	40,000	October 1972
Hyogo	110,000	---	---
Tokuyama	140,000	---	---
Tomakomai	---	70,000	October 1973
Kansai Sekiyu: Sakai	110,000	100,000	October 1973
Kashima Sekiyu: Kashima	180,000	---	---
Koa Sekiyu:			
Marifu	149,000	---	---
Osaka	80,000	120,000	April 1974
Kyokuto Sekiyu: Chiba	60,000	40,000	October 1972
	---	50,000	October 1974
Kyushu Sekiyu: Oita	100,000	70,000	October 1972
Maruzen Sekiyu:			
Chiba	155,000	40,000	October 1972
Matsuyama	50,000	---	---
Shimotsu	37,500	---	---
Mitsubishi Sekiyu:			
Kawasaki	105,000	---	---
Mitsushima	170,000	50,000	April 1973
	---	50,000	April 1974
Nichimo Sekiyu: Kawasaki	57,000	43,000	April 1973
Nihonkai Sekiyu: Toyama	30,000	30,000	April 1973
Nihon Kogyo:			
Funakawa	14,150	---	---
Mizushima	195,200	40,000	April 1973
Nihon Sekiyu: Niigata	26,000	---	---
Nihon Sekiyu Seisei:			
Kudamatsu	42,000	---	---
Muroran	10,000	100,000	October 1973
Nigishi	220,000	110,000	October 1972
Yokohama	70,000	---	---
Seibu Sekiyu: Yamaguchi	50,000	60,000	October 1972
	---	80,000	October 1974
Showa Sekiyu:			
Kawasaki	149,000	---	---
Niigata	43,000	---	---
Showa Yokkaichi: Yokkaichi	180,000	80,000	October 1972
	---	50,000	October 1973
Taiyo Sekiyu: Kikuma	59,000	10,000	October 1974
Teiseki Topping: Kubiki	4,410	---	---
Toa Sekiyu:			
Kawasaki	100,000	---	---
Nagoya	---	100,000	October 1973
Toa Nenryo Kokyo:			
Kawasaki	150,000	50,000	October 1972
Shimizu	43,500	---	---
Wakayama	187,000	70,000	October 1973
Toho Sekiyu: Owase	40,000	---	---
Tohoku Sekiyu: Sendai	40,000	60,000	October 1973
Total	4,109,360	1,943,000	

As in past years, Japan's 1971 output of crude oil was a mere half percent of refinery throughput, and natural gas production was also small by world standards. In contrast, imports were substantial and were growing sharply each year. Thus, sources of crude oil from abroad, whether produced by foreign or Japanese companies, and the delivered price to Japan are basic factors affecting refiners and petroleum consumers.

The recent increase in the price of Middle East crude oil, the source of four-fifths of Japan's 1971 imports, has had significant repercussions. Early in 1971, tanker rates were also increased. Comparing the period April 1970 to March 1971 with the period April 1971 to September 1971, the

Japanese estimated the following increases in c.i.f. per barrel import cost: crude oil, from $1.83 to $2.21; fuel oil (average), from $2.33 to $2.99; and naphtha (petrochemical uses) from $2.40 to $2.48. Freight and insurance for crude oil increased from $0.413 to $0.450 per barrel. The situation in the last quarter of 1971 was rather confused. For the year as a whole, Japan's oil import total cost was in the neighborhood of $3.5 billion.

To cope with the problem of future oil supply, the Overall Energy Council published an interim report on December 6, 1971, which has been referred to as "Japan's New Oil Policy."[17] Growth in energy demand in Japan will continue to be spectacular, with oil supplying 70 percent of future needs. Japan must acquire this in the light of increasing world competition. Influence in world supply has shifted in part from international oil companies to OPEC countries. Better cooperative relations will have to be established with international oil companies, OPEC countries, socialist countries, and oil-consuming countries in general. Japanese companies will have to be strengthened and organized for controlling larger shares of capacities and markets. Crude oil prices probably will rise, at least through 1975 and energy sources will shift somewhat to nuclear power and LNG. Ecology and congestion problems will come into play and larger inventories will be needed in the future. Security of stable supply at low cost will become increasingly important. "Free-hand crude" must be increased at the expense of "tied crude."

To achieve supply stability, there must be diversification of sources away from the Middle East and OPEC and towards the Asian Continental Shelf, Southeast Asia, the Soviet Union, and independent suppliers. Supply methods need not be confined to development of new sources by the Japanese or jointly with foreigners but can cover formulas whereby Japan farms in or purchases developed oilfields, or Japan loans funds in exchange for future oil deliveries. Straight import formulas can be improved to take in more of the Japanese viewpoint. Specifically, "Japan's New Oil Policy" calls for the following: Greater integration of oil development-refining-marketing operations; increased understanding of the international oil situation both in terms of producers and consumers; larger shares of future oil supply to be provided by Japanese controlled companies; more awareness of the interrelationships between refining and product flow in areas near Japan; careful studies of Japanese oil consumption patterns; more flexible adaptation of oil companies to congested land and environmental conditions; improved methods to cope with major fire and oil pollution hazards; streamlining of the domestic oil distribution system; substantial increases in oil storage facilities so as to raise inventories from 45 days to at least 60 days; and a more aggressive role by the Government in coping with all these outlined problems, and with the oil administration in general, by providing necessary legislation and funds.

Stability in Japan, which consumes one-tenth of the world's oil supply, would strengthen position of consuming countries. Japan should aim at supplying 30 percent of its crude oil needs by 1985. To achieve this objective, the Japan Petroleum Development Corporation must be drastically strengthened and a Petroleum Special Account should be established to provide the funds.

The draft budget of the Government of Japan for fiscal year 1972[18] reflects this trend. After an MITI-proposed Petroleum Special Account requesting 61 billion yen was turned down in September 1971, petroleum was attached to a new Coal and Petroleum Special Account and called for only 25.8 billion yen,[19] most of which would go to the Japan Petroleum Development Corporation (JPDC) and particularly to JPDC's loan and investment program to private firms. Funds for the Coal and Petroleum Special Account will be supplied from revenues derived from crude oil and fuel oil import duties. The budget also calls for the Japan Development Bank to provide 270 billion yen for 6.2- to 7.7-percent loans to finance facilities related to expanding refining, marketing, storage, pipelines, pollution control, the Japanese-flag merchant fleet, and other activities. The oil industry also will enjoy effective April 1972 a special and more favorable depreciation rate with regard to newly constructed crude oil storage tanks of 50,000 cubic meters or larger.

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[17] Japan Petroleum Weekly (Tokyo). Japan Petroleum Consultants, Ltd. Dec. 13, 1971, pp. 2–4, and six subsequent weekly issues.

[18] Japan Petroleum Weekly (Tokyo). Japan Petroleum Consultants, Ltd. Jan. 17, and 24, 1972, pp. 1–7.

[19] Converts to $83.6 million at the new exchange rate of 308 yen=US$1.00.

Japan's overseas oil development projects, as of November 1971, are shown in the tabulation that follows:[20]

Firm	Date established	Capital (billion yen)	Name of project
Arabian Oil Co	February 1958	25	Offshore, Neutral Zone.
N. Sumatra Oil Development Co	May 1960	2	Land, North Sumatra.
Sabah Oil Development Co	February 1969	1.94	Land, Offshore Sabah.
Indonesia Oil Development Co	February 1966	17.49	Offshore, North Sumatra.
JAPEX Canada Ltd	August 1966	1.6	Western part of Canada.
Alaskan Petroleum Development Co	September 1966	4	Cook Inlet and Bristol Bay.
JAPEX Australia Pty., Ltd	October 1966	.42	New Guinea, Offshore Queensland.
Kyushu Oil Development Co	July 1967	5	S and SE Kalimantan.
Abu Dhabi Oil Co	January 1968	9	Offshore, Abu Dhabi.
Middle East Oil Co	September 1968	5.94	Land, Abu Dhabi.
Qatar Oil Co	April 1969	5.6	Offshore, Qatar.
Alaska Maruzen Oil Co	do	.02	Alaska.
Mitsui Oil Development Co	July 1969	5.96	Offshore, Thailand.
Sabah Marine Areas Co	December 1969	1.82	Offshore to northeast of Sabah.
North Slope Oil Co	February 1970	3	North Slope.
Japan Low Sulfur Oil Co	March 1970	2	Offshore, northwest Java.
Egyptian Oil Development Co	July 1970	1.8	Gulf of Suez.
Congo Oil Co	August 1970	.94	Offshore, the Congo.
Colombia Oil Co	October 1970	1.2	Offshore, Colombia.
Godo Oil Co	November 1970	3.35	El Bunbuq.
Marine Oil Co	March 1971	.23	Offshore, Colombia and Honduras.
Oceania Oil Co	July 1971	.26	Land and Offshore, West Australia.
Southeast Asia Oil Co	September 1971	.125	Khorat Plateau, Gulf of Siam.
Iranian Oil Co	do	3.9	Land, Iran.
Nigerian Oil Co	November 1971	.9	Offshore, Nigeria.

Source: Look Japan (Tokyo). Japan Federation of Economic Organizations, Dec. 10, 1971, p. 10.

Three important developments occurred in 1971 with regard to Iran which supplied about 45 percent of Japan's crude oil imports during the year. First, a Japanese consortium of JPDC, Teijin Ltd., North Sumatra Oil Development Co., Mitsui & Co., and Mitsubishi Corp., together with Mobil Oil Company signed an agreement on November 8 with the National Iranian Oil Co. (NIOC) to form a 50–50 joint venture for the exploration and development of the Lureston oil concession, reported to be one of the world's promising oilfields yet untapped. Terms include a 9-year exploration period in conjunction with an 8,000-square-kilometer concession, a $40 million signature bonus, and a $52 million commitment for exploration expenses.

Secondly, negotiations were underway at yearend between Japanese interests and the NIOC to develop about 10 trillion cubic meters of gas reserves on Qishm Island at the southern tip of the Persian Gulf uncovered by an international consortium which subsequently waived its rights to NIOC. Marubeni-Iida and Fuji Oil, the Japanese principals were trying to interest others such as Phillips Petroleum, Tokyo Electric Power, Nippon Kokan, and Mitsui & Co. to join this involved LPG project. If Qishm reaches the commercial stage, NIOC will come in on a 50–50 joint venture.

Thirdly, Japan's Mitsui group of companies has decided to join NIOC in building a $350 million petrochemical complex by 1976, each putting up $50 million and borrowing the rest.

In Saudi Arabia, Mitsubishi Trading Co. jointly with the Chiyoda Chemical Co. were on the verge of signing a contract early in November to build a new refinery at Riyadh and expand the existing refinery at Jidda at the cost of at least $127 million, to be compensated in an exchange deal for about 10 million metric tons of "royalty" crude oil.

Indonesia, which furnished one-sixth of Japan's crude oil imports in 1971, has been of special interest because of its great oil potential and the low-sulfur nature of its crude. Offshore oil has started to flow, and Southeast Asia may yield as much as 3 million bpd (or roughly 150 million metric tons) of crude by 1980. The price of low-sulfur Minas crude took two price jumps during 1971, the latest rise on October 1, to $2.60 per barrel. Although Japanese interest in Indonesian oil may eventually wane because of price increases, in

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[20] Look Japan (Tokyo). Japan Federation of Economic Organizations. Dec. 10, 1971, p. 10.

1971 the Japanese were still interested in developing new oilfields. For example, Mitsui & Co., Marubeni-Iida, and the Far East Oil Trading Co. (Indonesian-Japanese venture) invested an additional $40 million late in the year in the hope of raising output of the Djatibarang oilfield in the Tjirebon region of West Java to 80,000 bpd in 1972 and eventually to 300,000 bpd. There is, however, more interest in offshore oil. Japex Indonesia and Union Oil were jointly developing the Attaka field, about 150 kilometers northeast of Balikpapan and 19 kilometers off the East Kalimantan coast, at a total cost of $110 million to achieve an output of 100,000 bpd in 1973. A production-sharing contract has been made with Pertamina of Indonesia.

In the fall of 1971 and early 1972, the Japanese were negotiating with the Soviets for the joint development of the Tyumen oilfields in western Siberia that would also involve a long-distance pipeline to the Pacific Coast. Costing $3 billion, the project could provide 25 to 50 million metric tons of crude oil to Japan annually.

The Japanese were making a serious bid in Nigeria late in the year. Nigeria Oil Co., Ltd., was formed by Teijin Ltd., Teikoku Oil, and Mitsui Oil Exploration later to be joined by JPDC, which eventually will be the half owner of the new company. Nigeria Oil in turn will join hands with the Nigerian National Oil Corporation (NINOC) when commercial quantities of oil will be found. At that time NINOC will reimburse Nigeria Oil with 51 percent of the exploration funds, pay 51 percent of future production costs, and obtain 51 percent of the total oil production. Meanwhile, Nigeria Oil will acquire a 20,000-square-kilometer offshore concession with 5-year exploration rights and 20-year production rights, pay the Nigerian Government a 1,600 million yen bonus upon signing a formal agreement and an annual sum of 100 million yen to "assist the promotion of education" in Nigeria. Exploration will begin in 3 months and a first test well will be drilled in 18 months after the agreement is signed.

Natural gas continued to gain in importance in Japan's energy supply.[21] During 1971, imports amounting to nearly a million metric tons (equal to about 1.4 million cubic meters) came entirely from Alaska for use by the Tokyo Electric Power Co. and the Tokyo Gas Co. MITI estimates that annual demand by 1975 would reach 5 million tons of LNG. Based upon projects already underway, probably more than 20 million tons of LNG would be shipped to Japan annually by 1980. Alaskan LNG came to Japan via Swedish-built 71,500-cubic-meter tankers, and natural gas from Brunei, the next important source, will be transported to Japan in French tankers. No doubt, Japan will be building its own LNG tankers soon. At yearend 1971, seven new natural gas projects involving Japanese participation were underway as follows:

Project	First shipment	LNG per year (million metric tons)
Brunei, Southeast Asia	1973	3.5 to 5
Das Island, Abu Dhabi	1976	[1] 3
Kharg Island, Iran	1976–77	4
Qeshm Island, Iran	1977	4 to 6
Palm Valley, Australia	1977–78	4 to 5
Burmah Oil, Australia	Unknown	Unknown.
Sarawak, Malaysia	do	Do.

[1] One LNG and two LPG.

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[21] U.S. Embassy, Tokyo, Japan. LNG for Japan: Projects and Tankers. State Department Airgram A48, Jan. 26, 1972, pp. 1–8.

The Mineral Industry of Kenya, Tanzania, and Uganda

By Avery H. Reed[1] and Robert G. Clarke[1]

KENYA[2]

The mineral industry of Kenya continued the steady expansion which has been underway for many years. The quantity of output expanded above the 1970 record and total value increased 11 percent, from $9.6 million to $10.6 million. New annual records were set for the production of barite, cement, common clay, feldspar, fluorspar, lime, and crushed stone.

Petroleum refinery output increased 4 percent, from 2.4 million to 2.5 million metric tons. New annual records were set for the production of distillate, gasoline, kerosine, and liquefied petroleum gas (LPG).

The principal exports from Kenya were cement, sodium compounds, and residual fuel oil. Leading imports were iron and steel products, crude petroleum, fertilizers, and coal.

Work continued on the development of the new zinc operation at Kinangoni. The operating company, Kenya Mining Industries, is 51 percent owned by the Government of Kenya and 49 percent owned by the Romanian Government.

Work continued on exploitation of a new large fluorspar deposit in the Rift Valley. The operating company is 51 percent owned by the Government of Kenya and the remaining 49 percent is owned by Continental Ore Corp. and Bamburi Cement Co. The company will be called Fluorspar Co. of Kenya.

COMMODITY REVIEW

Metals.—*Beryllium.*—Production of beryl in 1970 was 4 tons valued at $1,344, 76 percent below 1967, the record year, when 17 tons valued at $6,056 were produced. Total beryl production, 1952–70, was 48 tons valued at $16,920.

Columbium.—Production of columbium during the period 1955–62 was 3 tons valued at $4,735. The record year was 1957 when 1 ton valued at $2,133 was produced. There has been no production since 1962.

Copper.—Copper production in 1971 was 73 tons valued at $74,656. In 1953, the record year, 3,049 tons valued at $223,518 were produced. Total production of copper, 1951–71, was 26,214 tons valued at $16,117,853.

Gold.—There was no production of gold in 1971, the second year since 1926 in which there was no gold production. During the period 1926–69, total production of gold was 1,089,495 ounces valued at $26,157,015. The record year was 1939, when 104,076 ounces valued at $1,701,708 were produced.

Lead.—During 1967, 1968, and 1969, 23 tons of lead valued at $3,570 were produced. It was reported that a new large lead-silver deposit had been discovered at Kinagoni.

Silver.—Production of silver in 1956, the record year, was 54,689 troy ounces valued at $46,113. Total silver production, 1926–69, was 608,894 troy ounces valued at $533,618.

Zinc.—In 1952, 814 metric tons of zinc ore valued at $93,024 were produced.

Nonmetals.—*Asbestos.*—Total production of amphibole asbestos during the period 1935–67 was 6,448 tons valued at $315,871. The record year was 1949, when 716 tons

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[1] Physical scientist, Division of Nonmetallic Minerals.

[2] Prepared by Avery H. Reed.

Table 1.—Kenya: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971 [p]
METALS			
Beryllium, beryl concentrate, gross weight	3	4	--
Copper, mine output, metal content	77	79	73
Gold, mine output, metal content troy ounces	17,903	NA	--
Silver, mine output, metal content do	1,668	NA	--
NONMETALS			
Abrasives, natural, corundum	119	60	NA
Barite	435	447	743
Carbon dioxide, natural	761	763	1,051
Cement, hydraulic	642,381	801,615	803,823
Clays:			
Bentonite	NA	56	--
Kaolin	1,472	1,770	NA
Diatomite	2,303	1,601	1,400
Feldspar	1,560	895	2,650
Fertilizer materials, crude phosphatic, guano	360	638	350
Fluorspar	1,861	3,904	6,561
Gaylussite [1] kilograms	15,000	20,400	--
Gem stones, precious and semiprecious:			
Amethyst carats	680,388	290	NA
Apatite (gem quality) do	85	--	--
Aquamarine do	38,980	56,700	NA
Garnet [2] kilograms	116	7,460	12
Ruby carats	11,955	12,385	16,700
Sapphire do	14,195	4,515	NA
Tourmaline do	3,020	70,450	82,900
Zircon do	--	3,035	--
Gypsum and anhydrite:			
For cement production	61,365	59,020	[3] 91,872
Other	480	1,067	NA
Total	61,845	60,087	91,872
Magnesite, crude	503	4	221
Meerschaum	1,851	70	NA
Salt:			
Marine	37,363	35,420	43,406
Rock	4,924	3,851	--
Total	42,287	39,271	43,406
Soda, raw crushed (trona)	2,568	2,879	1,932
Soda ash	105,908	167,477	161,260
Stone, sand and gravel:			
Calcite, not further described	NA	51	--
Coral for cement manufacture thousand tons	--	--	918
Kunkur [4] for cement manufacture	95,702	57,118	51,499
Limestone for cement manufacture thousand tons	832	1,048	1,015
Limestone, other do	NA	24	NA
Limestone products, not further described	[r] 24,091	24,149	28,127
Quartzite	--	20	--
Sand, glass sand only	NA	12,348	8,728
Shale	123,613	144,000	187,050
Volcanic ash for cement manufacture	--	863	1,866
Vermiculite	776	1,668	1,359
Wollastonite	691	100	--
MINERAL FUELS AND RELATED MATERIALS			
Petroleum refinery products:			
Gasoline, motor thousand 42-gallon barrels	2,508	2,663	2,776
Jet fuel do	1,192	2,365	NA
Kerosine do	946	574	2,871
Distillate fuel oil do	3,230	3,306	3,585
Residual fuel oil do	6,760	7,439	6,445
Other do	419	797	NA
Refinery fuel and losses do	805	341	NA
Total do	15,860	17,485	15,677

[p] Preliminary. [r] Revised. NA Not available.

[1] Hydrous sodium-calcium carbonate mineral.

[2] Quality (gem or industrial), not specified.

[3] Figure probably includes gypsum for other than cement production.

[4] Local name applied to a variety of calcareous stone.

Table 2.—Kenya: Exports of major mineral commodities to countries outside of East African Economic Community[1]

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Gold, metal, unworked or partly worked troy ounces	16,044	--
Iron and steel:		
Metal:		
Scrap	3,739	6,913
Semimanufactures	3,035	846
Other nonferrous metals, scrap	2,200	2,621
NONMETALS		
Abrasives	619	279
Cement	309,041	348,575
Fertilizer materials, manufactured	1,425	1,739
Lime	22	30
Salt and brine	210	308
Sodium compounds, soda ash, sodium carbonate	86,260	159,677
Stone, sand and gravel	558	52
MINERAL FUELS AND RELATED MATERIALS		
Gas, hydrocarbon	733	165
Petroleum:		
Refinery products:		
Gasoline thousand 42-gallon barrels	157	172
Kerosine and jet fuel do	1,302	1,393
Distillate fuel oil do	674	779
Residual fuel oil do	3,701	4,187
Other do	147	1

[1] Excludes reexports.

valued at $17,475 were mined. There has been no production since 1967.

Barite.—Production of 743 tons of barite valued at $29,580 in 1971 was the largest for any year. Total barite produced during the period 1965–71 was 2,380 tons valued at $125,350.

Calcite.—In 1970, 51 tons of calcite valued at $1,820 were produced. This was the only year in which calcite was produced.

Carbon Dioxide.—Record output of carbon dioxide in 1971 was 1,051 tons valued at $271,726. Total production of carbon dioxide 1951–71 was 14,210 tons valued at $3,063,029.

Cement.—Production of cement in 1971 was a record 803,823 tons valued at $18,919,720. Total cement production, 1955–71 was 6,872,119 metric tons valued at $152,787,244.

Clays.—Bentonite, common clay, and kaolin were produced in 1971, for cement and other uses.

Common clay production in 1971 was 187,050 tons valued at $261,800. This was a new annual record, 30 percent above the 1970 record. Total production of common clay, 1955–71, was 1,470,433 tons valued at $1,713,841.

Kaolin production in 1970 was 1,770 tons valued at $121,450; this was 73 percent below the 1963 record, when 6,663 tons valued at $14,563 were produced. Total kaolin production, 1941–70, was 40,926 tons valued at $567,868.

Corundum.—Production of corundum in 1970 was 60 tons valued at $3,276, 50 percent below the 1969 record. Total corundum production, 1967–70 was 249 tons valued at $18,889.

Diatomite.—Production of diatomite in 1971 was 1,400 tons valued at $78,400. This was 77 percent below the 1952 record, when 6,026 tons valued at $178,276 were produced. Total production of diatomite, 1942–70, was 75,788 tons valued at $3,106,079.

Feldspar.—Production of feldspar in 1971 was a record 2,650 tons valued at $109,200. Total feldspar production, 1948–71, was 6,384 tons valued at $261,545.

Fluorspar.—Fluorspar production in 1971 was a record 6,561 tons valued at $107,033. Total production of fluorspar, 1968–71, was 12,519 tons valued at $290,128.

Gem Stones.—Production of gem stones in 1971 was valued at $6,286, 82 percent below the 1964 record. Total gem stone production, 1961–71, was valued at $163,117.

Graphite.—Total production of graphite, 1944–60 was 4,542 tons valued at $542,828. The record year was 1960, when 1,010 tons valued at $78,467 were produced. There has been no production of graphite since 1960.

Table 3.—Kenya: Imports of major mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum metal, including alloys, all forms	983	1,684
Copper metal including alloys, all forms	585	2,481
Gold metal ... troy ounces	7,030	6,091
Iron and steel:		
Ore and concentrate	5,762	9,549
Metal:		
Scrap	--	256
Pig iron, ferroalloys, and similar materials	577	796
Steel, primary forms, ingots and other	16	7,058
Semimanufactures:		
Bars, rods, angles, shapes, sections	33,776	32,110
Universals, plates, and sheets	832,322	119,491
Hoop and strip	2,144	1,715
Rails and accessories	3,414	289
Wire	7,543	12,527
Tubes, pipes and fittings	7,279	15,671
Castings and forgings, rough	--	2
Lead metal including alloys, all forms	316	554
Nickel metal including alloys, all forms	4	2
Tin metal including alloys, all forms ... long tons	1,073	117
Zinc metal including alloys, all forms	1,924	2,984
Other, nonferrous metals, scrap	143	17
NONMETALS		
Asbestos	3	--
Cement	1,215	986
Clays and products (including all refractory brick):		
Crude n.e.s	861	507
Products	2,123	924
Feldspar, fluorspar, cryolite and chiolite	310	--
Fertilizer materials:		
Crude:		
Nitrogenous	29	1
Phosphatic	--	191
Manufactured:		
Nitrogenous	11,084	21,002
Phosphatic	17,864	19,843
Potassic	2,548	4,842
Other, including mixed	33,737	44,640
Ammonia	53	19
Graphite, natural	5	4
Lime	91	45
Mica, all forms	23	11
Salt and brine	4,387	1,097
Stone, sand and gravel:		
Dimension stone	104	60
Dolomite	48	--
Gravel and crushed rock	604	267
Limestone [1]	94	69
Quartz and quartzite	--	4
Sand	46	17
Sulfur, elemental, all forms	543	509
MINERAL FUELS AND RELATED MATERIALS		
Coal, all grades including briquets	31,358	82,915
Coke and semicoke	1,190	1,454
Petroleum:		
Crude and partly refined ... thousand 42-gallon barrels	15,206	16,465
Refinery products:		
Gasoline ... do	171	435
Kerosine and jet fuel ... do	644	484
Distillate fuel oil ... do	264	368
Residual fuel oil ... do	1	119
Lubricants ... do	205	161
Other ... do	26	19

[1] Includes gypsum, plasters and similar stone used for the manufacture of lime or cement.

Gypsum.—Production of gypsum in 1971 was a record 91,872 tons valued at $598,752. Total gypsum production, 1943–71, was 514,699 tons valued at $3,284,142.

Kyanite.—Total production of kyanite, 1943–60, was 102,465 tons valued at $2,162,978. The record year was 1949, when 23,633 tons valued at $992,928 were produced. There has been no production of kyanite since 1960.

Lime.—Production of lime in 1971 was a record 28,127 tons valued at $650,961. Total lime production, 1941–71, was 493,955 tons valued at $7,972,219.

Magnesite.—Production of magnesite in 1971 was 221 tons valued at $4,950. In 1959, the record year, 2,852 tons valued at $27,994 were produced. Total magnesite production, 1943–71, was 7,913 tons valued at $105,865.

Meerschaum.—A small quantity of meerschaum valued at $100 was produced in 1970. In 1958, the record year, 34 tons valued at $12,852 were produced. Total production of meerschaum, 1955–70, was 155 tons valued at $66,256.

Mica.—Production of sheet mica in 1959, the record year, was 11 tons valued at $2,912. Total sheet mica production, 1943–68, was 33 tons valued at $25,628. There has been no production of mica since 1968.

Pumice.—Production of pumice in 1960, the record year, was 2,458 tons valued at $4,603. Total production of pumice, 1955–67, was 15,612 tons valued at $78,991. There has been no production of pumice since 1967.

Quartz.—Production of quartz in 1970 was 20 tons valued at $1,305. In 1958, the record year, 2,880 tons valued at $15,876 were produced. Total quartz production, 1944–70, was 6,477 tons valued at $40,250.

Salt.—Production of salt in 1971 was 43,406 tons valued at $1,189,398; this was 29 percent below 1968, the record year, when 61,001 tons valued at $2,049,250 were produced. Total salt production, 1939–71, was 831,676 tons valued at $18,809,918.

Sand and Gravel.—Production of sand in 1971 was 8,728 tons valued at $42,764. Total sand production, 1966–71, was 34,642 tons valued at $163,489.

Soda.—Production of soda in 1971 was 163,192 tons valued at $5,339,152. Total soda production, 1936–71, was 3,465,842 tons valued at $94,788,120.

Stone.—Production of crushed limestone in 1971 was a record 1,983,801 tons valued at $1,934,831. Total crushed limestone production, 1948–71, was 10,575,676 tons valued at $9,819,188. Most of the limestone was used for cement manufacture.

Total production of crushed sandstone, 1960–72, was 88,915 tons valued at $78,641. There has been no production since 1962.

Talc.—Production of talc in 1949, the record year, was 589 tons valued at $9,722. Total talc production, 1944–54, was 3,190 tons valued at $57,044. There has been no talc production since 1954.

Vermiculite.—Production of vermiculite in 1971 was 1,359 tons valued at $32,536. Total vermiculite production, 1949–71, was 6,685 tons valued at $97,286.

Wollastonite.—Production of wollastonite in 1970 was 100 tons valued at $4,760. In 1968, the record year, production was 1,381 tons valued at $60,388. Total wollastonite production, 1967–70, was 2,150 tons valued at $81,768.

Mineral Fuels.—*Petroleum.*—Commercial oil and gas have not been discovered to date in Kenya. During 1971, one exploratory well was drilled to a depth of 12,247 feet. Exploration continued.

The oil refinery at Mombasa which started in 1963 continued to produce petrolum products.

Asphalt.—Production of asphalt in 1971 was 46,648 tons valued at $1,920,800. Total production of asphalt, 1964–71, was 273,616 tons valued at $11,258,800.

Distillate Fuel Oil.—Production of distillate in 1971 was a record 544,896 tons valued at $38,446,800. Total distillate production, 1963–71, was 2,970,689 tons valued at $209,616,000.

Gasoline.—Record production of motor gasoline in 1971 was 421,904 tons valued at $38,866,800. Total production of gasoline, 1963–71, was 2,297,028 tons valued at $211,601,600.

Kerosine.—Production of kerosine in 1971 was a record 436,416 tons valued at $43,610,000. Total kerosine production, 1963–71, was 1,971,295 tons valued at $197,041,600.

Liquified Petroleum Gas (LPG).—LPG production in 1971 was a record 28,542 tons valued at $2,016,000. Total production of LPG, 1964–71, was 67,105 tons valued at $4,743,200.

Residual Fuel Oil.—Production of residual fuel oil in 1971 was 979,728 tons valued at $38,404,800. Total residual fuel oil production, 1963–71, was 7,878,851 tons valued at $305,905,600.

TANZANIA[3]

Diamond production again dominated Tanzania's mineral industry. Diamond production was valued at $19.1 million, down from $22.5 million in 1970. Holdings in the diamond industry by the Government-owned National Development Corp. (NDC) were the largest profit maker for the Government in 1970. The Central Selling Organization purchased all of the diamond output.

Exploration for petroleum was reportedly all seismic in 1971; no wells were drilled.

COMMODITY REVIEW

Metals.—*Gold and Silver.*—Production of gold and byproduct silver decreased drastically to less than 3 percent of the 1970

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[3] Prepared by Robert G. Clarke.

Table 4.—Tanzania: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971 p
METALS			
Gold, refined ... troy ounces	16,015	[1] 7,859	167
Silver, refined ... do	2,123	1,102	36
Tin, mine output, metal content ... long tons	112	104	114
Tungsten, mine output, metal content	6	5	4
NONMETALS			
Clays, kaolin	721	464	828
Cement, hydraulic	169,637	167,296	177,504
Diamond:			
Gem [2] ... carats	394,086	359,030	341,687
Industrial [2] ... do	383,203	349,115	473,196
Total ... do	777,289	708,145	814,883
Gem stones, precious and semiprecious, except diamond:			
Amethyst ... kilograms	NA	153	69
Aquamarine ... do	10	--	2
Beryl (gem only) ... do	19	17	35
Chrysoprase and opal ... do	--	2	5
Corundum (gem only) ... do	57	142	33
Garnet ... do	66	146	33
Ruby and sapphire ... do	239	61	11
Tourmaline ... do	87	46	2
Zircon ... do	10	4	(3)
Zoisite (tanzanite) ... do	20	66	16
Gypsum and anhydrite, crude	10,684	20,718	17,139
Lime (quicklime and hydrated lime)	10,570	346,025	5,117
Magnesite, crude	1,498	690	1,001
Meerschaum ... kilograms	10,860	9,760	14,500
Mica:			
Sheet	94	45	37
Scrap	111	13	NA
Salt, all types	33,015	41,944	35,114
Stone, sand and gravel:			
Ornamental stones:			
Artstone	10	57	20
Amethystine quartz	7	(3)	NA
Glass sand	2,625	3,938	53
Vermiculite	123	150	--
MINERAL FUELS AND RELATED MATERIALS			
Coal, bituminous	2,479	2,664	2,790
Petroleum refinery products:			
Gasoline, motor ... thousand 42-gallon barrels	926	1,039	1,041
Jet fuel ... do	291	350	444
Kerosine ... do	256	234	121
Distillate fuel oil ... do	972	1,144	1,175
Residual fuel oil ... do	2,076	2,341	2,379
Other ... do	37	48	54
Refinery fuel and losses ... do	358	373	336
Total ... do	4,916	5,529	5,550

p Preliminary.

[1] Exports.

[2] Figures for 1969 and 1970 represent estimates based on reported total diamond output and best available information on ratio of gem to industrial stones in total output.

[3] Less than ½ unit.

Table 5.—Tanzania: Exports of major commodities to countries outside the East African Economic Community[1]

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum metal, including alloys, semimanufactures	169	217
Gold, metal, unworked or partly worked ... troy ounces	16,017	7,927
Iron and steel:		
Metal:		
Scrap	3,483	3,053
Semimanufactures	740	187
Silver metal including alloys ... troy ounces	2,023	917
Tin, ore and concentrate ... long tons	176	241
Tungsten, ore and concentrate	20	19
Other, nonferrous metal, scrap	1,150	1,107
NONMETALS		
Artstone[2]	11	--
Cement	1,812	2,302
Diamond, all grades ... carats	780,210	719,660
Magnesite	1,367	405
Mica, all forms	199	27
Precious and semiprecious stones, except diamond ... kilograms	513	--
Quartz and quartzite	138	--
Salt and brine	12,887	3,876
MINERAL FUELS AND RELATED MATERIALS		
Gas, hydrocarbon	579	328
Petroleum refinery products:		
Gasoline ... thousand 42-gallon barrels	1,153	1,158
Kerosine and jet fuel ... do	293	371
Distillate fuel oil ... do	1,726	1,711
Residual fuel oil ... do	800	1,209
Other ... do	5	--

[1] Excludes reexports.

[2] Corundum-zoisite rock; including rough amethystine quartz.

quantities. The industry has ceased except for exploration efforts to find new deposits or to extend old workings.

Tin.—The production of tin concentrate continued to decline; 1971 production was down 29 percent compared with that of 1970.

Nonmetals.—*Cement.*—Production increased 6 percent, a gain which was well below the estimated 10 percent growth rate for consumption. The deficit had to be made up by imports, but cement plant construction expansion programs are expected to eliminate future imports.

Cement production consumed 13,000 tons of gypsum, or nearly 80 percent of the gypsum production.

Clays and Quartz (glass sand).—Kaolin and glass sand production was all by Tanzania Refractories and Bricks Ltd. and was used by the company.

Diamond.—Williamson Diamonds accounted for the entire diamond production. The total quantity of gem and industrial diamond was greater than in 1970 but the value decreased because of the higher ratio of industrial diamond to gem diamond. However, diamond dominated the mineral production of the country, accounting for 70 percent in value of production and 80 percent in value of mineral exports.

Other Gem Stones.—Tanzania contributed a variety of precious and semiprecious gem stones to world trade in addition to diamond. Gem zoisite accounted for about 10 percent of the weight of exports of these other gem stones but was valued at more than one-third of the value as appraised by the Mineral Resources Division of the Ministry of Commerce and Industries of the United Republic of Tanzania.

Salt.—Nyanza Salt Mines Ltd., a member of the NDC of Tanzania, obtained a financial commitment for a solar evaporation plant with a capacity of 60,000 tons of salt per year from the Tanzania Investment Bank. Production will be of two types, table and grained, and will be for the local and export markets.

Mineral Fuels.—*Coal.*—Production increased 5 percent. The tea estates accounted for nearly all coal consumption.

Petroleum.—The Tanzania Petroleum Development Corporation (TPDC) is the

Table 6.—Tanzania: Imports of major mineral commodities
(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum metal including alloys:		
Unwrought	2,774	2,559
Semimanufactures	284	317
Copper metal including alloys, all forms	171	250
Gold metal troy ounces	152	52
Iron and steel:		
Ore and concentrate	1,450	1,443
Metal:		
Pig iron, ferroalloys and similar materials	1,357	1,525
Steel, primary forms, ingots and other	2	1
Semimanufactures:		
Bars, rods, angles, shapes, sections	13,627	25,383
Universals, plates and sheets	808,122	74,933
Hoop and strip	2,719	3,138
Rails and accessories	5,643	16,085
Wire	3,098	6,792
Tubes, pipes and fittings	11,978	12,453
Castings and forgings, rough	--	1
Lead metal including alloys, all forms	85	132
Tin metal including alloys, all forms long tons	34	45
Zinc metal including alloys, all forms	1,984	2,177
Other nonferrous metals, scrap	143	96
NONMETALS		
Abrasives, natural	52	15
Cement	6,459	17,482
Clays and products (including all refractory brick):		
Crude clays, n.e.s	335	354
Products	2,340	843
Feldspar, fluorspar, cryolite and chiolite	11	11
Fertilizer material:		
Manufactured:		
Nitrogenous	4,121	3,082
Phosphatic	3,029	3,222
Potassic	1,688	2,197
Other including mixed	15,150	15,846
Ammonia	27	12
Graphite, natural	1	1
Lime	312	38
Mica, all forms	13	8
Salt and brine	17,090	4,729
Stone, sand and gravel:		
Dimension stone	84	21
Dolomite	16	--
Limestone [1]	112	184
Gravel and crushed rock	488	265
Sand	29	16
Sulfur, elemental, all forms	290	207
MINERAL FUELS AND RELATED MATERIALS		
Coal all grades including briquets	119	168
Coke and semicoke	332	1,050
Petroleum:		
Crude and partly refined thousand 42-gallon barrels	4,594	5,442
Refinery products:		
Gasoline do	r 743	689
Kerosine and jet fuel do	156	213
Distillate fuel oil do	1,896	1,658
Residual fuel oil do	1,044	997
Lubricants do	90	151
Other do	r 76	6

r Revised.

[1] Includes gypsum, plasters and similar stone used for the manufacture of lime or cement.

sole concession holder in Tanzania.[4] A service contract was granted to AGIP S.p.A. in 1969 pertaining to an area which included the Continental Shelf and the islands. Seismic surveys will dominate the exploratory effort up to 1973. The geology and geophysics of coastal Tanzania were described based on work performed by The British Petroleum Company Limited and Shell International Oil Company Limited between 1950 to 1960.[5]

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[4] American Association of Petroleum Geologists Bulletin. Tanzania. V. 55, No. 9, September 1971, p. 1601.

[5] Kent, P. E., J. A. Hunt, and D. W. Johnstone. The Geology and Geophysics of Coastal Tanzania. Geophysical Paper No. 6. Natural Environment Res. Council, Institute of Geological Sciences, Her Majesty's Stationery Office, 1971, 101 pp. and map.

UGANDA [6]

Copper mining and smelting dominated the mineral industry of Uganda in 1971. Production of blister copper decreased 7 percent in quantity and 28 percent in value as world prices for copper continued the decline started in 1970. Lower copper prices contributed in great measure to the drop in total mineral production value of Uganda.

A committee was established by the Government to investigate exploitation of minerals in western Uganda.[7] The Country's third 5-year plan, which commenced in June 1971, gave priority to exploiting its mineral wealth, which has been described as vast reserves of iron ore and potential sources of oil and gold.

Table 7.—Uganda: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971 p
METALS			
Beryllium, beryl concentrate, gross weight	286	367	221
Bismuth, mine output, metal content ... kilograms	e 770	780	884
Columbium and tantalum, ore and concentrate, gross weight ... do	1,900	3,000	7,900
Copper:			
Mine output, metal content	19,439	19,159	18,031
Metal, blister, primary	16,564	16,958	15,731
Gold, mine output, metal content ... troy ounces	3	--	--
Iron and steel, steel ingots	20,551	19,521	16,435
Tin, mine output, metal content ... long tons	163	109	146
Tungsten, mine output, metal content	531	730	662
NONMETALS			
Cement, hydraulic	172,946	191,072	205,110
Fertilizer materials, phosphatic:			
Crude, apatite	e 145,000	218,312	12,374
Superphosphate	22,832	24,761	23,888
Lime (quicklime and hydrated lime)	e 20,000	21,279	--
Salt, evaporated	4,803	2,277	2,409

e Estimate. p Preliminary.

Table 8.—Uganda: Exports of major mineral commodities to countries outside the East African Economic Community [1]

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Beryllium, beryl ore and concentrate	319	258
Copper, metal, blister and other unrefined unalloyed	16,637	16,710
Iron and steel, metal: Semimanufactures	4,487	1,149
Tin, ore and concentrate ... long tons	232	185
Tungsten, ore and concentrate	176	228
Other, nonferrous metal scrap	860	1,105
NONMETALS		
Cement	2,433	2,357
Fertilizer materials	8	5
Lime	5	--
Salt and brine	1,497	966

[1] Excludes reexports.

COMMODITY REVIEW

Metals.—*Beryllium.*—Beryl production decreased 40 percent. The world market for beryllium concentrates was depressed. As a consequence, the value of beryllium ore concentrates exports decreased 20 percent. The difference, production minus exports, represents material remaining on hand in Uganda.

Bismuth.—The value of bismuth production decreased 67 percent.

Columbium-Tantalum. — Columbite-tantalite (niobium, or columbium, and tantalum concentrates) increased in both quantity and value. The Commissioner of Geological Survey and Mines reported that

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[6] Prepared by Robert G. Clarke.

[7] Mining Magazine. Ugandan Minerals Committee. V. 125, No. 2, August 1971, p. 143.

Table 9.—Uganda: Imports of major mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum metal including alloys, semimanufactures	1,623	1,085
Copper metal including alloys, all forms	314	1,915
Gold metal troy ounces	2,865	198
Iron and steel:		
Metal:		
Scrap	1	--
Pig iron, ferroalloys, and similar materials	529	585
Steel primary forms, ingots and other	617	48
Semimanufactures:		
Bars, rods, angles, shapes, sections	13,113	11,399
Universals, plates	715,820	122,402
Hoop and strip	1,294	2,755
Rails and accessories	1,663	2,187
Wire	1,986	3,804
Tubes, pipes and fittings	5,582	9,561
Lead metal including alloys, all forms	78	52
Tin metal including alloys, all forms long tons	221	21
Zinc metal including alloys, all forms	1,669	1,348
Other, nonferrous metals, scrap	40	32
NONMETALS		
Asbestos	1,957	1,120
Cement	566	954
Clays and products (including all refractory brick):		
Crude n.e.s	473	170
Products	2,268	1,044
Feldspar, fluorspar, cryolite and chiolite	2,215	822
Fertilizer materials:		
Manufactured:		
Nitrogenous	2,059	3,220
Phosphatic	635	1,828
Potassic	2,694	5,696
Other including mixed	9,712	12,851
Ammonia	10	9
Graphite, natural	5	1
Lime	1	--
Mica, all forms	7	3
Salt and brine	22,539	11,858
Stone, sand and gravel:		
Dimension stone	321	15
Dolomite	303	239
Limestone [1]	305	32
Gravel and crushed rock	213	263
Sand	26	6
Sulfur, elemental, all forms	4,532	2,096
MINERAL FUELS AND RELATED MATERIALS		
Coal, all grades including briquets	47	25
Coke and semicoke	417	487
Petroleum:		
Refinery products:		
Gasoline thousand 42-gallon barrels	28	18
Kerosine and jet fuel do	6	7
Lubricants do	48	58
Other do	8	2

[1] Includes gypsum, plasters, and similar stone for the manufacture of lime or cement.

the results of investigations in the area around Lumino revealed worthwhile deposits of tantalite and columbite.

Copper-Cobalt.—Kilembe Mines Ltd., Uganda's only copper producer, reported a 7-percent decline in the quantity of blister copper due to technical difficulties early in 1971 at the Jinja smelter.[8]

The value of blister copper produced declined 28 percent due to depressed prices in the world copper market. Kilembe Mines reported mining 948,354 tons of ore at 1.8 percent copper which yielded 57,887 tons of concentrate assaying 28.2 percent copper. Kilembe Mines announced plans to process large stocks of cobaltiferous pyrite to provide about 1,000 tons of cobalt annually.[9]

Iron and Steel.—Two small plants converted scrap to 16,435 tons of ingots from which various shapes of structural steel and strapping were rolled. Feasibility studies were made for processing iron ore to steel from a magnetite deposit near Sukulu and iron ore deposits at Muko.

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[8] Mining Journal. Uganda Copper Output. V. 277, No. 7111, Dec. 3, 1971, p. 518.

[9] Barclays Bank DCO (in cooperation with Barclays Bank of Uganda, Ltd.—Kampala) Uganda. An Economic Survey. July 1971, 36 pages.

Nonmetals.—*Cement.*—Cement production by Uganda Cement Industries increased 5 percent in quantity but decreased 8 percent in value. A railway spur line connecting the new Hima Cement Factory, Western Region, to the Kampala-Kasese Line was completed.[10] The Hima plant has an initial annual capacity of 100,000 tons. The management approved plans to add three kilns to expand output of the Hima plant to 900 tons per day by 1973. Uganda imported 30,000 tons of cement from Bamburi Cement Co., Kenya, in 1970 to meet the acute cement shortage.

Salt.—The Uganda Development Corporation confirmed the feasibility of constructing a salt plant at Lake Katwe based on pilot plant operations.[11] Financing terms for a plant were approved with the West German Government.

Mineral Fuels.—Potential sources of oil will be investigated according to a concession agreement negotiated between Comoro Exploration Ltd. and the Uganda Government.[12] The concession covers the area of the faulted Rift Valley depression.

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[10] Cement, Lime, and Gravel. Uganda. V. 46, No. 12. December 1971, p. 302.

[11] Mining and Minerals Engineering. Salt Project in Uganda. V. 7, No. 8, August 1971, p. 33.

[12] Plummer, H. G. Uganda. The American Association of Petroleum Geologists Bulletin. V. 55, No. 9, September 1971, p. 1602.

The Mineral Industry of North Korea

By Frank B. Fulkerson [1]

North Korea's 2.4-million-ton iron and steel industry was being further expanded in 1971. Capacity for producing iron ore and coal was also being increased to provide a raw material base for greater steel production. By world standards, mine output of tungsten, graphite, and magnesite continued to be notable, and production of coal, lead, zinc, pyrite, and barite was also of some global significance.

North Korea was more important than the Republic of Korea as a mineral producer and ranked about third in the Far East, after Japan and the People's Republic of China. Although North Korea is endowed with a great variety of mineral resources, ores are often low grade and oil and gas have not been discovered. An ambitious 6-year program was launched in 1971 to raise industrial output. Development of mining and power industries was being given highest priority.

Planned expenditures in the national budget for 1971 totaled 7.3 billion won, a 21-percent increase over those of 1970. Mineral-related industries receiving capital allocation increases over that of 1970 were as follows, in percent: coal, 30; iron and steel, 50; chemical fertilizers and insecticides, 80; and electric power, 50.

Among the few specific projects mentioned were new production facilities at the Kimchaek steel plant, a petroleum refinery, the Sŏdu-su hydroelectric powerplant, and the Pukch'ang and Unggi thermal power stations. No important new mineral-industry facilities were announced as completed in 1971, despite the relatively large amount of new investment scheduled.

Geological surveys were being stressed across the board with a view towards delineating additional reserves. Special attention was given to the anthracite deposits in South Pyongan Province (the best in the country) and to the bituminous coal deposits in North Hamgyŏng Province. Geological survey work was also planned to be stepped up in the case of iron ore, copper and other nonferrous metals, alloy element ores, such as tungsten, nickel, molybdenum, and chrome, and crude oil and gas.

A chief economic task continued to be the strengthening of North Korea's steel industry. Although the country possesses abundant though low-grade iron ore resources, it lacks coking coal. The steel industry was asked to expand pig iron output with the least possible consumption of coke, which had to be imported, and with the maximum use of indigenous fuel. Greater production of granulated iron was called for. Simultaneously, the hope was to initiate production of sponge iron and direct reduction of ore at an early date, and conduct research in electric smelting. Stress was placed on variety and product quality of steels.

The need for more coal was emphasized, not only for making pig iron, but also for use in generating electric power and for other industrial uses. The coal mining industry was asked to do more high-speed tunneling and drilling and to achieve greater productivity at the working faces.

Official goals for the 6-year plan to be achieved in 1976, in million tons unless otherwise specified, with estimated percentage growth over 1970 were as follows:

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[1] Industry economist, Division of Nonmetallic Minerals.

Commodity	Target	Estimated growth over 1970 (percent)
Coal	50–53	82–93
Pig iron	3.5–3.8	46–58
Steel ingots and castings	3.8–4.0	73–82
Rolled steel	2.8–3.0	47–58
Chemical fertilizers	2.8–3.0	87–100
Cement	7.5–8.0	88–100
Magnesite, clinker	1.6	129
Electric power (billion kilowatt hours)	28–30	70–82

Instead of quantities, 1976 targets for most metals were announced as percentage increases, as follows: Iron ore and concentrate, 80 percent; primary copper, 70 percent; primary lead and zinc, 180 percent; and tungsten, 90 percent. Estimated production in 1976 that would correspond to these percentage gains would be iron ore, 14.4 million tons; copper, 22,000 tons; lead and zinc, 420,000 tons; and tungsten (metal content of mine output), 4,100 tons.

PRODUCTION

In an effort to make a successful start on the first year of the current 6-year plan, a 100-day special drive was carried out at the beginning of 1971. Increases in industrial production were alleged to have been achieved as the result of the drive, including gains for coal, iron ore, steel, rolled steel, chemical fertilizers, cement, magnesite clinker, and electricity. During the remainder of the year there were scattered, nebulous reports relating to individual mine and plant output increases for a number of commodities. Mineral commodities singled out for expansion in 1971, were, with their planned increases over 1970 in percent: coal, 20; rolled structural steel, 40; cement, 30; and chemical fertilizers, 20. At yearend, it appeared that the production increases for these commodities had not reached the announced percentage goals.

Table 1.—North Korea: Estimated production of mineral commodities

(Thousand metric tons unless otherwise specified)

Commodity [1]	1969	1970	1971
METALS			
Cadmium metric tons	110	110	110
Copper:			
Mine output, metal content	12	13	13
Metal, refined, primary	12	13	13
Gold, mine output, metal content thousand troy ounces	160	160	160
Iron and steel:			
Iron ore and concentrate	7,500	8,000	8,500
Pig iron and ferroalloys [2]	2,250	2,400	2,500
Steel ingots and castings	2,000	2,200	2,400
Steel semimanufactures	1,750	1,900	2,200
Lead:			
Mine output, metal content	70	70	80
Metal, primary	55	55	65
Nickel, primary	1	1	1
Silver, mine output, metal content thousand troy ounces	700	700	700
Tungsten, mine output, metal content metric tons	2,150	2,150	2,150
Zinc:			
Mine output, metal content	125	130	135
Metal, primary	60	90	100
NONMETALS			
Barite	120	120	120
Cement, hydraulic	3,000	4,000	4,800
Fertilizer materials, crude, natural, phosphates (apatite)	300	300	300
Fluorspar	30	30	30
Graphite	75	75	75
Magnesite:			
Crude	1,500	1,600	1,700
Clinker	700	700	800
Pyrite and pyrrhotite (including cupreous):			
Gross weight	500	500	500
Sulfur content	200	200	200
Salt, all types	550	550	550
Talc, soapstone, steatite, and pyrophyllite	70	80	90

See footnotes at end of table

Table 1.—North Korea: Estimated production of mineral commodities—Continued

(Thousand metric tons unless otherwise specified)

Commodity	1969	1970	1971
MINERAL FUELS AND RELATED MATERIALS			
Coal:			
Anthracite	20,100	21,800	24,300
Bituminous [3]	4,700	5,500	6,000
Other	200	200	200
Total	25,000	27,500	30,500
Coke	2,000	2,200	2,200

[1] In addition to the items listed, a number of other mineral commodities apparently are produced, but information is inadequate to make reliable estimates of output levels. These include (but are not limited to) antimony, arsenic (in arsenopyrite), asbestos, beryl, bismuth, boracite, china clay (kaolin), chromium, cobalt, columbite, germanium, indium, lithium minerals (lepidolite), manganese ore, mica (phlogopite), molybdenite, monazite, selenium, silicon, tellurium, titanium minerals (ilmenite and rutile), zircon, and a variety of crude construction materials including miscellaneous clays, glass sand, building sand, stone, and gravel.

[2] Includes Krupp-Renn granulated iron.

[3] Includes low-calorie coal, much of which might be classified as low-rank coal.

TRADE

North Korea's important mineral exports included iron ore, pig iron, and steel semimanufactures; a number of nonferrous metals, such as lead, zinc, cadmium, and silver; and various nonmetallics, particularly barite, cement, magnesite, and talc. Principal mineral imports were petroleum products, coke and coking coal, and ferroalloys and ferroalloy ores.

The U.S.S.R. and Japan were the main trading partners. Exports to West Germany, Belgium-Luxembourg, the Netherlands, and Poland were also of considerable significance. As North Korea's official trade statistics are not available, data in tables 2 and 3 on the country's foreign trade are based upon reports from other countries. Figures on mineral trade between North Korea and People's Republic of China were not disclosed by either country, but quantities probably were relatively small as compared with North Korea's trade with the U.S.S.R. and Japan. The bulk of the country's oil, coking coal, and ferroalloy ore requirements were met by shipments from the U.S.S.R. Based upon Japanese statistics, exports of iron ore from North Korea to Japan declined from 535,000 tons in 1970 to 475,000 tons in 1971, and exports of zinc concentrate to Japan plummeted from 62,000 tons in 1970 to 3,000 tons in 1971.

North Korea and the U.S.S.R. entered into a new 5-year trade agreement in 1971, calling for a 55-percent increase in trade compared with the previous 5-year period.[2] North Korea will supply nonferrous metals, magnesite clinker, and manufactured products in exchange for coke, petroleum and petroleum products, ferrous and nonferrous metals, chemicals, and machinery and tools. Another long-term trade agreement was signed with East Germany under which North Korea will export magnesite clinker and industrial products in exchange for chemicals and various types of other manufactured products.

The 1968–70 trade agreement between North Korea and India was extended for a further 2-year period to the end of 1972. Commodities that were listed as available for export from North Korea to India included nonferrous metals, alloy and special steels, and machine tools. Commodities that were listed as available for export to North Korea from India were manganese and chrome ores, coal and coke, diesel oil, gasoline, mica, jute goods, and light manufactured products. To date mineral commodity trade between the two countries has not developed to significant proportions. Trade talks were also held with Poland and Albania.

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[2] Quarterly Economic Review. People's Republic of China, Hong Kong, and North Korea. The Economist Intelligence Unit (London). No. 1, March 1971, p. 13.

Table 2.—North Korea: Apparent exports of selected mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Cadmium	96	94	All to U.S.S.R.
Copper and alloys, all forms	1,231	1,582	Belgium-Luxembourg 869; West Germany 489.
Iron and steel:			
Iron ore and concentrate	543,962	534,617	All to Japan.
Pig iron and cast iron	162,748	122,272	U.S.S.R. 69,000; Japan 53,272.
Sponge iron	30,203	13,992	All to Japan.
Iron and steel powders	4,079		
Ferroalloys	1,300	--	
Steel:			
Primary forms	11,663	6,076	All to Japan.
Semimanufactures	84,967	4,000	All to Spain.
Lead: Metal and alloys, all forms	26,007	20,943	West Germany 19,480.
Silver, unworked and partly worked value, thousand dollars	$2,039	$4,731	Japan $2,541; West Germany $1,549.
Tungsten ore and concentrate	28	7	All to United Kingdom.
Zinc:			
Ore and concentrate	73,110	80,280	Japan 62,480; U.S.S.R. 17,800.
Metal and alloys, all forms	40,477	31,291	U.S.S.R. 14,929; Japan 6,676; West Germany 3,505.
Other metals and alloys, all forms	14	76	Belgium-Luxembourg 45; West Germany 19.
NONMETALS			
Barite	46,015	67,100	All to U.S.S.R.
Cement	375,000	457,000	Do.
Graphite	6,179	13,721	Japan 12,810; Austria 911.
Feldspar and fluorspar	4,302	6,162	All to Japan.
Magnesite	387,591	421,702	U.S.S.R. 207,300; Poland 104,258; Japan 49,730; West Germany 35,707.
Quartz and quartzite	4,586	5,042	All to Japan.
Sand, gravel and crushed stone	--	740	Do.
Talc, soapstone and steatite	70,410	85,282	U.S.S.R. 43,400; Japan 33,905; Poland 7,977.
Other nonmetals; slag and similar materials from steel manufactures	--	10,142	All to Japan.
MINERAL FUELS AND RELATED MATERIALS			
Coal, coke and briquets	56,440	85,727	Do.

[1] Compiled from import data of Australia, Austria, Belgium-Luxembourg, Canada, Denmark, Finland, France, West Germany, Greece, Iceland, Ireland, Israel, Italy, Japan, Netherlands, New Zealand, Norway, Poland, Portugal, Spain, Sweden, Switzerland, the U.S.S.R., the United Kingdom and Yugoslavia (Turkey, 1969 only).

Source: For Poland and the U.S.S.R.: Official import statistics of the respective countries; for all other countries: 1969 and 1970 editions of: Statistical Office of the United Nations, Supplement to the World Trade Annual. V. 5, Walker and Company, New York.

Table 3.—North Korea: Apparent imports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodities	1969	1970	Principal sources, 1970
METALS			
Aluminum metal and alloys, unwrought and semimanufactures	4,362	2,244	U.S.S.R. 2,150; France 94.
Chromium, chromite ore and concentrates	22,000	21,000	All from U.S.S.R.
Cobalt, oxide and hydroxide	--	12	All from Netherlands.
Iron and steel:			
Pig iron and cast iron	4,064	--	
Ferroalloys	7,000	7,600	All from U.S.S.R.
Semimanufactures	14,878	9,152	U.S.S.R. 7,590; Japan 965; Poland 597.
Manganese ore	21,000	21,000	All from U.S.S.R.
Mercury 76-pound flasks	290	--	
Other, nonferrous metal and alloy semimanufactures	111	75	All from U.S.S.R.
NONMETALS			
Asbestos	4,300	4,036	Do.
Fertilizer materials, crude, potassic	42,900	--	
Sulfur, elemental	^{r}5,912	7,266	All from U.S.S.R.
MINERAL FUELS AND RELATED MATERIALS			
Coal, all grades thousand tons	606	587	Do.
Coke do	203	156	U.S.S.R. 106; Poland 50.
Petroleum, crude and refinery products do	772	2,338	Japan 1,500; U.S.S.R. 838.

See footnotes at end of table

Table 3.—North Korea: Apparent imports of mineral commodities[1]—Continued

(Metric tons unless otherwise specified)

Commoditys	1969	1970	Principal sources, 1970
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum-, coal- and gas-derived crude chemicals……thousand tons..	19	18	All from U.S.S.R.

[r] Revised.

[1] Compiled from export data of Australia, Austria, Belgium-Luxembourg, Canada, Denmark, Finland, France, West Germany, Greece, Iceland, Ireland, Israel, Italy, Japan, the Netherlands, New Zealand, Norway, Poland, Portugal, Spain, Sweden, Switzerland, the U.S.S.R., the United Kingdom, and Yugoslavia, (Turkey, 1969 only).

Source: For Poland and the U.S.S.R.: Official foreign trade statistics of the respective countries; for all other countries: 1969 and 1970 editions of Statistical Office of the United Nations, Supplement to the World Trade Annual. V. 5. Walker and Company, New York.

COMMODITY REVIEW

METALS

Iron Ore and Steel.—It was officially claimed that the country's iron mines more than met the 1971 production quota. In the northeast, Musan, by far the largest iron mine, supplied concentrate to the Kimchaek, Songjin, and Ch'ŏngjin steelworks on the eastern coast in addition to foreign markets. The Chaeryŏng, Hasŏng, Unyul, and other mines in the western region provided ore to the Hwanghae and Kangson steel plants near P'yongyang. All iron mines were directed to prove up more reserves to support the 80-percent increase in ore production called for in the 6-year plan.

New rock drills were introduced at the Musan mine in 1971, and at midyear it was alleged the planned rate of tunneling was exceeded by over 400 percent. In recent years large-scale equipment for blasting, conveying, and ore dressing has been installed at Musan. A number of other lesser but still important mines reportedly also made production gains in 1971. North Korea's exports of iron ore to Japan averaged just over one-half million metric tons annually during 1970–71.

One of the major construction projects in North Korea was the installation of a "steel shop" at the Kimchaek steel works. References in 1971 stated progress on this project was satisfactory. The shop, which is slated to have an annual capacity to produce 1 million tons of steel ingot, is being built with assistance from the Soviet Union.[3] In 1968 it was announced that basic oxygen converters would be built, but there has been no further news on this.

At the Hwanghae steel works, North Korea's largest, an ore sintering plant was being built. No mention was made of any projects at the Kangson steel works. Under the 6-year plan, the rolling mills at Hwanghae and Kangson are to be enlarged. New furnaces and auxiliary equipment completed at Hwanghae late in 1970 came into full production in 1971. An automated remote control system for iron and steel making was said to have been installed at the Songjin steel plant. As far as known, the 6-year plan does not call for any expansion at Songjin. The small Ch'ŏngjin plant, which produces mainly granulated iron, was said to be increasing output. In August it was stated that North Korea's daily pig iron and steel output was running 50 to 70 percent above the average daily output of the first 6 months of the year.

Nonferrous Metals.—Little information was available on North Korea's nonferrous mines and smelters in 1971, although emphasis evidently was placed on increasing mechanization of rock tunneling, ore mining, ore transport, and ore dressing. The Kŏmdŏk lead-zinc mine, one of the largest nonferrous ore mines in the country, was credited with substantially overfulfilling production quotas in 1971 through mechanization efforts. Innovations in rock tunneling and ore production were noted also at the Songhung mine, the country's largest gold-silver-copper mine.

The ambitious 6-year plan for nonferrous metals called not only for expansion of existing smelters, but also construction of a new copper smelter, an additional lead and zinc smelter, and an aluminum reduction plant, the country's first. No information was available on the degree of implementation of these projects.

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[3] Work cited in footnote 2.

In 1971, Japan imported only 3,000 metric tons of zinc concentrate from North Korea, as opposed to 62,480 tons in 1970.

NONMETALS

Cement.—Indications were that the authorities were not satisfied with conditions in the building materials industries, particularly with regards to cement. Throughout the year, the cement industry was enjoined to improve limestone mining and crushing methods and increase the quality and quantity of cement production. It did appear, however, that cement production increased compared with 1970 tonnage, partly because of the completion of a new, apparently medium-sized plant and a number of small, local plants.

The 6-year plan calls for increasing cement output from the 4 million tons produced in 1970 to 7.5 to 8.0 million tons in 1976, to be accomplished by increasing productivity and building one large, several medium, and some small-scale plants.

As far as individual plants are concerned, it was stated that the Sŭngho-ri cement plant, one of the country's largest, was stepping up production by more effectively utilizing existing equipment. The Chŏnnae-ri cement plant introduced a new, high-speed calcining method and installed a cooler to increase substantially the quantity and quality of clinker. The cement industry planned to disseminate to all dry-type cement plants the success gained at the Chŏnnae-ri plant. Another plant known as the February 8 cement factory also introduced innovations.

Fertilizer Materials.—Total output of chemical fertilizer was scheduled to increase 20 percent in 1971. Most of this increase apparently was to come from greater use of existing facilities, as there were no reports of new fertilizer plants being completed in 1970 and 1971. In May the Hungnam fertilizer production center on the east coast was again favorably mentioned for substantially increasing output of superphosphates, with lesser gains for urea, ammonium sulfate, and agricultural chemicals. The Chongsu and Sunch'on plants in South P'yongan Province also were said to have stepped up production of nitrolime and other nitrogenous fertilizers. There was an absence of news on North Korea's apatite mines. The North Koreans have been trying to increase the supply of apatite used to produce superphosphates.

Magnesite.—Important quantities of magnesite were mined and calcined for domestic use as well as for export to the U.S.S.R., People's Republic of China, Poland, and other countries. The key Yongyang magnesite mine in South Hamyŏng Province was cited for having exceeded the production plan for the fourth quarter of 1971. Earlier in the year the mine was favorably mentioned for making efficient use of its large-size equipment and for stepping up the rate of blasting. Other magnesite mines did well also.

MINERAL FUELS

Coal.—At the beginning of 1971, directives called for a 20-percent increase in coal production over the 27.5 million tons produced in 1970. Emphasis was to be placed on greater mechanization and increased tunneling and earth-moving to develop new reserves. The increased production was to come from small and medium mines as well as from large collieries with extensive deposits.

The Sinch'ang mine, which is the largest in North P'yongan Province, was commended at midyear for overfulfilling its daily production targets by perfecting new cutting methods to fit the coal seam conditions and by raising the operating rate of machinery. In the same province the large Yongdae coal mine and several smaller mines also were said to be exceeding their daily production plans.

In North Hamgyŏng Province, which produces badly needed higher grade bituminous coal, the Aoji and Kocham mines, two of the largest in the province, were increasing output at midyear.

Petroleum.—Requirements were met by imports from the U.S.S.R. Announcement was made that construction was continuing as scheduled on a large "oil-processing factory." This announcement could refer to a U.S.S.R.-sponsored, 1-million-ton-per-year oil refinery scheduled in 1968 to be built at Sinŭiju, North P'yongan Province. A 2½-year absence of any news on the project led analysts to the belief the project had been shelved. Sources stated that an oil refinery was scheduled in 1971 to be erected at Unggi on the eastern coast in North Hamgyŏng Province near the U.S.S.R. border.

Another large project in North Korea was the construction of a hydroelectric power station on the Sŏdu-su, a tributary of the Tumen River, in North Hamgyŏng Province. This important project was said to be nearing completion. Thermal powerplants were under construction at Puch'ang and Unggi.

The Mineral Industry of the Republic of Korea

By Harold J. Drake [1]

The Republic of Korea's mineral and related industries have made notable progress in recent years, contributing increasingly to the economy. However, growth in the mineral processing sector, based mainly upon imported raw materials, has been much faster than that in the mining sector concerned with the extraction of indigenous ores. The most important areas of mineral processing include petroleum refining, cement production, fertilizer manufacture, steel smelting, and to a lesser extent, nonferrous smelting. In mining, the Republic's production of anthracite, amorphous graphite, and tungsten rank high by world standards and minerals like salt, fluorspar, talc, pyrophyllite, and kaolin are of some significance. Production indexes of some major components of the mineral processing and mining sectors for the last 2 years were as follows (1965 = 100):

	1970	1971
Petroleum and coal processing	336	408
Glass, clay, and stone products	248	299
Chemical products	453	539
Cement manufacture	360	426
Metal smelting	313	364
Metal processing	252	263
Coal mining (anthracite)	121	125
Metal mining	120	121
Stone, clay, and sandpits	109	202
Tungsten mining	90	90

The second 5-year Economic Development Plan, 1967–71, ended in 1971 with substantial gains recorded in gross national product (GNP) and more modest growth in the mineral industry. The GNP, at constant 1965 won, totaled 1,567 billion won in 1971, a gain of 10.2 percent over that of 1970 and 71.5 percent over that of 1966. Similarly, industrial manufacturing in 1971 was up 19.1 percent from the 1970 level and 172.5 percent from the 1966 level. In terms of 1965 prices, the value of production of mining and quarrying reached 19.5 billion won in 1971, 1.6 percent above the 1966 level.

Inflation was severe during the 5-year period, although it was slowing down and under control in recent years. The wholesale price index (1970 = 100) for all commodities stood at 108.6 in 1971 compared with 74.6 in 1966. Comparable data for minerals as a whole were 105.4 and 76.3 respectively; for metallic ores, 104.0 and 84.3 respectively; and for nonmetallic ores, 108.0 and 62.1, respectively.

Construction of the iron and steel works of the Pohang Iron and Steel Company, Ltd., located at Pohang proceeded according to schedule in 1971. By yearend overall construction was more than 50 percent complete with work started on all major units. The plant has a designed crude steel capacity of 1,032,000 metric tons per year and consists mainly of a blast furnace, two basic oxygen furnace (BOF) converters, a blooming mill, billet mill, hot-rolled strip mill, and a plate mill. The primary plant is scheduled for completion in July 1973. The company is currently planning additional facilities including another blast furnace and converter, a continuous casting plant, a structural mill, and a cold rolling sheet mill. The additions will raise the crude steel capacity of the plant to 2,600,000 metric tons per year. Completion date for the second stage is tentatively set for 1978.

The Asian Development Bank signed an agreement to loan $22 million to the Republic of Korea to help finance the construction of the multipurpose dam at Andong. The principal purpose of the dam is to impound water for municipal and industrial use and for irrigation. Power generation is a secondary consideration. The Andong dam is expected to reduce flood damage in the Naktong River basin by a third.

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[1] Physical scientist, Division of Nonmetallic Minerals.

Growth of the industrial center at Ulsan continued unabated in 1971. In the past two 5-year plans, ending in 1971, about 10 percent of the total investment of the plans was expended in Ulsan, which contributed greatly to the establishment of many of the 40 or more major industrial facilities now located there. Included in the center are a large petrochemical complex scheduled for completion in 1973, an oil refinery, an aluminum reduction plant, and a fertilizer plant.

PRODUCTION

Mineral production in 1971 was valued at an estimated 52.4 billion won ($151 million),[2] the bulk of which was accounted for by coal and nonmetallic minerals. Compared with 1970, value of mine output in terms of the won rose about 10 percent.

Production of anthracite coal rose about 3 percent to 12.8 million tons valued at 37.5 billion won ($108 million). Output of crushed limestone rose by 17 percent, to 10.6 million tons valued at 4.5 billion won ($13 million), in response to steadily increasing demand by Korean cement producers. Output of salt (marine) declined from 405,000 tons in 1970 to 372,000 tons in 1971; value, however, rose from 3.2 billion won ($9 million) to 3.7 billion won ($11 million). Other nonmetallic minerals that recorded significant production gains over the preceding year were fluorspar 21 percent; amorphous graphite, 19 percent; sand, 56 percent; and pyrophyllite, 18 percent. Declines in production were reported for feldspar, 40 percent; quartzite, 38 percent; and talc, 16 percent.

Production of copper, silver, and zinc was higher in 1971 than in the preceding year. Output of copper was valued at 4.5 billion won ($12.9 million); silver at 550 million won ($1.6 million); and zinc at 1.8 billion won ($5.3 million). Production of gold was valued at 277 million won ($800,000), off about 44 percent from the 1970 value. Iron at 1.2 billion won ($3.4 million) and lead at 508 million won ($1.5 million) each were off 12 percent from the 1970 level. Production of tungsten was valued at 1.7 billion won ($5 million), a total comparable to that of 1970.

Operations of petroleum refineries in 1971 recorded a substantial gain of 16 percent in volume over that of 1970. The great bulk of the increased output was residual fuel which at 46 million barrels was 24 percent above 1970 output.

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[2] Where necessary, values have been converted from Korea won (Kw) to U.S. dollars at the rate of Kw 347.7=US$1.00.

Table 1.—Republic of Korea: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971 [p]
METALS			
Aluminum, primary	6,600	15,450	17,593
Antimony, mine output, metal content	[e] 30	--	--
Bismuth	111	106	97
Copper:			
Mine output, metal content	1,330	1,639	1,774
Metal, refined, including secondary	[r] 5,564	5,117	6,849
Gold [1] ... troy ounces	50,734	51,345	28,807
Iron and steel:			
Iron ore and concentrate ... thousand tons	710	571	504
Pig iron	41,000	47,736	22,606
Ferroalloys	11,000	13,310	14,504
Crude steel ... thousand tons	[2] 374	[2] 481	518
Lead:			
Mine output, metal content	16,477	16,016	16,543
Metal	3,478	3,600	3,135
Manganese, ore and concentrate, gross weight	2,902	3,401	2,263
Molybdenum, mine output, metal content	130	115	106
Nickel, mine output, metal content	--	9	NA
Silver ... thousand troy ounces	906	1,494	1,543
Tin, mine output, metal content ... long tons	--	--	5
Tungsten, mine output, metal content	1,971	2,069	2,059
Zinc:			
Mine output, metal content	[r] 20,582	23,980	28,161
Metal, primary	2,310	2,300	9,004
NONMETALS			
Asbestos	5,910	1,373	NA
Cement, hydraulic ... thousand tons	4,865	5,812	6,872
Clays, kaolin ... do	136	195	191
Diatomite	2,916	2,584	3,162
Feldspar	23,435	28,121	16,887
Fluorspar, all grades	39,173	47,780	57,886
Graphite:			
Crystalline	920	218	1,776
Amorphous	73,414	59,312	70,739
Kyanite and related materials, andalusite	54	38	NA
Salt, marine ... thousand tons	289	405	372
Stone, sand and gravel n.e.s.:			
Crushed and broken limestone ... do	7,415	9,104	10,617
Stone, not further described (quartzite) ... do	226	259	161
Sand (including glass sand) ... do	87	105	164
Talc and related materials:			
Pyrophyllite	101,170	120,124	142,335
Talc	[r] 84,346	83,949	70,114
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	454	3,345	7,500
Coal, anthracite ... thousand tons	10,273	12,394	12,785
Fuel briquets, anthracite briquets ... do	9,194	10,000	8,479
Peat ... do	9	8	NA
Petroleum refinery products:			
Gasoline ... thousand 42-gallon barrels	4,774	5,623	6,504
Kerosine ... do	2,220	3,252	3,579
Jet fuel ... do	3,126	4,623	3,749
Distillate fuel oil ... do	9,605	11,240	13,737
Residual fuel oil ... do	26,739	37,117	45,979
Other ... do	5,422	6,446	7,988
Refinery fuel and losses ... do	3,126	5,745	4,075
Total ... do	55,012	74,046	85,611

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] Officially reported production only.

[2] Excludes castings.

TRADE

Exports of mineral commodities and related products rose in 1970, the latest year for which detailed statistics are available, principally because of increased shipments of nonmetallic minerals. Exports of cement totaled 450,865 tons valued at $4.4 million, an increase of 55 percent in quantity and 33 percent in value over 1969 levels. Anthracite exports were up 44 percent to 337,919 tons valued at $3.9 million while the value of exports of petroleum refinery products rose from $2.2 million in 1969 to $4.8 million in 1970. Exports of metalliferous ores and concentrates in 1970 were dominated by tungsten shipments which totaled 8,290 tons valued at $17.2 million compared with 3,712 tons valued at $12.4 million in 1969. Exports of lead ore and concentrates declined to 17,209 tons valued at $3.2 million; zinc ore and concentrates decreased to 39,466 tons valued at $2.7 million. Exports of iron ore and concentrates, totaled 515,000 tons valued at $4.5 million, levels well below those of 1969.

Imports of mineral commodities continued to supply a substantial share of mineral raw material requirements of the Republic of Korea. Principal nonmetallic minerals that recorded substantial increases in imports were asbestos, 35,292 tons valued at $5.9 million; crude fertilizer materials, 533,757 tons (value not reported); salt 247,489 tons (value not reported); and elemental sulfur, 149,975 tons valued at $4.4 million. Sharp declines were again recorded in imports of cement 967 tons valued at $89,000, and manufactured fertilizers, 100,170 tons valued at $4.1 million, as output from production facilities within the Republic soared. Imports of gypsum and plasters and coal also recorded declines in 1970.

Imports of metallic ores and scrap were valued at $70.3 million in 1970. About 88 percent of this value represented imports of iron and steel scrap which rose 20 percent, to 839,939 tons. Imports of copper and manganese ores were slightly below those of 1969.

As the Republic of Korea begins to rely on its own petroleum refinery output, imports of refinery products should begin to decline. Such was the case in 1970, as imports of aviation gasoline, distillate and residual fuel oil, and crude hydrocarbon-based crude chemicals declined sharply. Imports of crude and partly refined petroleum, the feedstock for the refineries, however, soared 34 percent to 74 million 42-gallon barrels.

Table 2.—Republic of Korea: Exports of mineral commodities

((Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum:		
Bauxite ore	NA	672
Metal including alloys, all forms	6,585	8,687
Arsenic, natural sulfides	NA	130
Chromium ore and concentrate	105	185
Copper:		
Matte	NA	18
Metal including alloys, all forms	NA	294
Iron and steel:		
Ore and concentrate thousand tons	678	515
Pig iron, and ferroalloys	4,150	8,965
Steel, primary forms	2,560	19,000
Semimanufactures	38,809	69,641
Lead ore and concentrate	17,873	17,209
Magnesium ore	NA	900
Molybdenum:		
Ore and concentrate	368	238
Trioxide	NA	5
Nickel, waste and scrap	NA	13
Silver:		
Silver, platinum and similar metal ores and concentrates	NA	2,870
Metal including alloys thousand troy ounces	24,981	33,234
Tin, ore and concentrate long tons	NA	21
Titanium slag	NA	300
Tungsten, ore and concentrate	3,712	8,290
Zinc:		
Ore and concentrate	39,873	39,466
Oxide	NA	65
Metal, waste, scrap and dust	NA	358
Other:		
Ash and residue containing nonferrous metals	NA	632
Oxides, hydroxides and peroxides of metals, n.e.s	NA	9
Metals, base metals, including alloys, all forms, n.e.s	95	69
NONMETALS		
Abrasives, natural, n.e.s.:		
Emery and natural corundum	NA	300
Dust and powder of precious and semiprecious stones kilograms	NA	600
Cement	290,970	450,865
Clays and products:		
Crude n.e.s.:		
Kaolin	41,003	89,027
Other	NA	17,825

See footnotes at end of table.

Table 2.—Republic of Korea: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970
NONMETALS—Continued		
Clays and products—Continued		
Products:		
Refractory	NA	1,068
Nonrefractory	NA	5,250
Cryolite	NA	250
Feldspar and related materials:		
Feldspar	47,776	5,825
Leucite, nepheline, and syenite		72,282
Fertilizer materials:		
Crude, phosphatic	NA	377
Manufactured:		
Nitrogenous	99,377	108,976
Mixed	--	10,712
Fluorspar	37,157	33,628
Graphite, natural	43,025	45,648
Gypsum and plasters	NA	97,486
Mica, crude	NA	1,550
Stone, sand and gravel:		
Dimension stone	NA	5,853
Dolomite, chiefly refractory grade	15,860	26,880
Gravel and crushed stone	NA	490
Quartz and quartzite	113,719	156,313
Sand, excluding metal bearing	NA	20,952
Sulfur:		
Elemental	NA	110
Sulfuric acid	NA	13,762
Talc and related materials:		
Talc, crude and ground	60,634	41,326
Steatite, natural		100
Other nonmetals, n.e.s.:		
Crude:		
Meerschaum, amber, jet	NA	798
Other	NA	4,136
Slag, dross and similar waste, not metal bearing	35,291	45,925
MINERAL FUELS AND RELATED MATERIALS		
Coal, anthracite	234,415	337,919
Petroleum refinery products:		
Gasoline, motor and aviation thousand 42-gallon barrels	467	1,192
Kerosine and jet fuel do	54	--
Distillate fuel oil do	113	--
Residual fuel oil do	142	467
Other do	--	62
Total do	776	1,721
Bunkers—all flags:		
Distillate fuel oil do	NA	[1] 458
Residual fuel oil do	NA	739

NA Not available.

[1] Includes other such as aviation gasoline, commercial jet fuel, and lubricants.

Table 3.—Republic of Korea: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum:		
Bauxite ore	NA	10,054
Oxide and hydroxide	NA	30,804
Fused alumina (artificial corundum)	NA	1,179
Metal including alloys, all forms	[r] 16,558	6,555
Chromium:		
Ore and concentrate	NA	1,726
Oxide and hydroxide	NA	454
Cobalt:		
Metal kilograms	NA	11
Oxides do	NA	21
Copper:		
Ore	14,905	14,792
Metal including alloys, all forms	3,322	5,690
Iron and steel:		
Ore	9.818	75,347
Metal:		
Scrap	700,878	839,939
Pig iron, ferroalloys, and similar materials	59,698	7,930
Steel, primary forms	315,773	325,114
Semimanufactures	255,374	181,177
Lead:		
Oxides	NA	29
Metal including alloys, all forms	2,565	2,107
Magnesium metal, including alloys, all forms	NA	31
Manganese:		
Ore and concentrates	11,307	10,402
Oxides	NA	530
Mercury 76-pound flasks	NA	4
Molybdenum, metal including alloys, all forms	NA	4
Nickel, metal including alloys, all forms	1,161	161
Platinum group and alloys troy ounces	NA	28,936
Rare-earth metals:		
Oxides kilograms	NA	500
Metals, including alloys do	NA	42,100
Silver and alloys troy ounces	NA	707
Tin, metal including alloys, all forms long tons	[r] 368	864
Titanium:		
Ore and concentrate	NA	3,331
Oxides	4,216	4,217
Tungsten, metal including alloys, all forms	NA	9
Zinc:		
Oxide	NA	32
Metal including alloys, all forms	8,326	9,731
Zirconium ore and concentrate	NA	150
Other:		
Ore and concentrate of base metals, n.e.s	NA	49
Ash and residue containing nonferrous metals	1,567	1,912
Oxides, hydroxides and peroxides of metals, n.e.s	NA	32
Metals, including alloys, all forms:		
Metalloids	NA	157
Pyrophoric alloys	NA	3
Base metals, including alloys, all forms, n.e.s	100	34
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc	NA	214
Grinding and polishing wheels and stones	112	212
Asbestos	27,632	35,292
Barite	NA	12
Boric acid	NA	228
Bromine	NA	1
Cement	15,727	967
Clays and products (including all refractory bricks):		
Crude n.e.s	NA	6,844
Products:		
Refractory (including nonclay bricks)	8,552	10,666
Nonrefractory	NA	384
Diatomite and other infusorial earths	NA	36
Fertilizer materials:		
Crude:		
Phosphatic	508,947	533,205
Other	1,283	552
Manufactured:		
Nitrogenous	110,530	7,564
Potassic	223,909	83,470
Mixed	7,618	9,136
Fluorspar	NA	1,492
Graphite, natural	NA	35

See footnotes at end of table.

Table 3.—Republic of Korea: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970
NONMETALS—Continued		
Gypsum and plasters	110,224	36,326
Iodine	NA	2
Magnesite, crude, calcined and magnesia clinker	NA	388
Mica, all forms	NA	30
Pigments, mineral, including processed iron oxides	NA	79
Precious and semiprecious stones, except diamond kilograms	NA	4,400
Salt	54,809	247,489
Sodium and potassium compounds, n.e.s	10,038	8,748
Stone, sand and gravel:		
Dimension stone, crude and partly worked	NA	638
Dolomite, chiefly refractory grade	NA	690
Gravel and crushed rock	NA	182
Quartz and quartzite	NA	29
Sand, excluding metal bearing	NA	2,436
Sulfur:		
Elemental, all forms	137,619	149,975
Sulfuric acid	NA	211
Talc, steatite, soapstone, and pyrophyllite	NA	20
Other n.e.s.:		
Crude	726	57
Slag, dross and similar waste, not metal bearing	NA	85
Oxides, hydroxides and peroxides of magnesium, strontium and barium	NA	135
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	221	584
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	NA	44
Carbon black	6,756	4,794
Coal and briquets:		
Anthracite and bituminous coal	28,327	16,754
Lignite and lignite briquets	NA	100
Coke and semicoke	63,638	63,245
Hydrogen, helium and rare gases	NA	13
Peat, including peat briquets and litter	NA	79
Petroleum:		
Crude and partly refined thousand 42-gallon barrels	55,300	74,046
Refinery products:		
Gasoline, aviation do	19	1
Kerosine do	--	44
Distillate fuel oil do	284	--
Residual fuel oil do	509	--
Lubricants, including grease do	68	110
Other [1] do	240	159
Total do	1 ,120	314
Mineral tar and other coal-petroleum- or gas-derived crude chemicals	18,405	6,492

[r] Revised. NA Not available.

[1] Includes topped crude and other unfinished oils requiring further processing.

COMMODITY REVIEW

METALS

Aluminum.—Output from the new reduction plant of Korean Aluminum Co. at Ulsan continued to soar. During the first year of the plant's operation, primary metal output totaled 17,593 tons compared with 6,600 tons in 1969. As a result of the installation of this plant, imports of primary aluminum and products thereof have declined sharply in recent years. However, the principal raw material for this plant is imported alumina.

Copper, Silver, and Gold.—The Ministry of Commerce and Industry of the Republic of Korea has been promoting the establishment of a new copper smelter in Masan with a capacity of 15,000 tons of electrolytic copper by 1976. Current capacity is 8,000 tons. The existing Changhang smelter and the new plant are designed to meet a projected demand in 1976 of 24,000 tons. The first phase of construction was expected to start in 1972, the second phase in 1973, with final completion in 1975. In addition to copper, the refinery was expected to produce 840 kilograms of gold, 16,800 kilograms of silver, and 70,000 tons of sulfuric acid.

Iron and Steel.—The Government-owned steel plant under construction at Pohang is not expected to disrupt the privately owned steel industry. The country's total steel capacity including new capacity coming on line in 1972 is 1 million tons per year. Approximately three-fourths of this capacity is accounted for by 14 electric furnaces installed since 1965. The remainder is accounted for principally by two open-hearth installations and two B.O.F. converters. These furnaces, using mainly scrap imported from the United States, supply 90 percent of the ingots and billets required by the industry for rolling. Demand for hot-rolled coil, sheet, and plate has been met mainly by imports from Japan. It is in this area, and because of the potentially large demand for tonnage plate products, that the Pohang facility was expected to augment the industry.

Tungsten.—The Korean Tungsten Mining Co., Ltd., which is 17.6 percent owned by the Government, reported a small output from its Dalsung mine and increased production at its Sangdong mine, which accounted for 89 percent of the Republic of Korea's tungsten production in 1971. Among the companies reporting minor output were Okbang Mining Co., Ltd., Bando Mining Co., Ltd., Woluk Mining Co., Ltd., and Chong Yang Industries Co., Ltd. Tungsten stocks on hand as of December 31, 1971, were approximately 1,215 tons.

Zinc.—Zinc refining operations consisting of two refineries, the Yong Ping Co. plant with an annual capacity of 8,000 tons and Tong Shin Chemical Products Co. plant with a capacity of 5,000 tons, were believed to be headed for expansion by the addition of another refinery at Yosu in the south. Completion date of the new project, if found to be economically feasible, is in 1974, but a certain amount of opposition, based on fears of pollution and for economic reasons, has developed.

NONMETALS

Cement.—During 1971, expansion programs were completed or commenced that called for annual capacity to increase from 6.9 million tons to 11.0 tons by 1973. Chung Buk Cement Manufacturing Co., Ltd. doubled in 1971 to 1 million tons, the annual capacity of its plant at Jecheon in Chung Bok Province. Hyun Dai Cement Co. was increasing the annual capacity of its Tanyang plant to 1 million tons by an expansion program scheduled for completion in June 1972. The current expansion program of Ssang Yong Cement Industrial Co., Ltd. was expected to increase its Tonghae plants annual capacity from 1 million tons to 2.07 million tons by 1973. In addition to the expansion of these facilities, a new firm, Ko Ryo Cement Manufacturing Co., Ltd., was constructing a plant at Changseung with an initial annual capacity of 800,000 tons.

Fluorspar.—Production of fluorspar, which consists almost wholly of metallurgical grade, continued to rise in response to increasing domestic demand. Japan, however, continued to be the principal market for output. Average grade of the ore is 35 percent CaF_2 which is beneficiated to metallurgical grade of 75 percent CaF_2.

MINERAL FUELS

Anthracite.—Rising demand and governmental actions in the form of development assistance and higher prices were incentives for producers to increase national output to a record high in 1971. Anthracite normally accounts for about two-thirds the value of mine output and therefore is vital to the economy of the Republic. Annual production is expected to reach 16 million metric tons by the end of the decade, which would be 3.2 million more than the tonnage registered in 1971. Known minable reserves are estimated to total 500 million tons. Little bituminous coal is produced, and the requirements of the domestic iron and steel industry must be met by imports.

The anthracite industry is dominated by the Government-owned Daihan Coal Corp., operating six large mines which in 1971 accounted for about 40 percent of the country's total production. At one time the Government's position in coal mining was far stronger; however, policy in recent years has been to encourage mining of coal by private companies. About three-fourths of the Republic's anthracite was consumed as household fuel, one-tenth for generation of electricity, and the remainder for industrial use and exports.

Petroleum.—The Republic of Korea imports all its oil requirements, and consumption has risen shaply in recent years. During the first 11 months of 1971, total petroleum imports were valued at $167 million or nearly 8 percent of all imports. Most of the petroleum was imported as crude oil, specifically 10.4 million metric tons or nearly 80 million barrels, worth $153 million, for the same 11 months. The country's refining capacity has been undergoing rapid expansion in order to accommodate the increasing quantities of crude oil imported.

At yearend 1971 the Honam Oil Refining Co., Ltd., was in the process of enlarging its 105,000-barrel-per-day (bpd) refinery at Yosu by 63,000 bpd, and the government-owned Korea Oil Corporation was enlarging its 115,000-bpd refinery at Ulsan (Wulsan) by 60,000 bpd. A third refinery was nearing completion at Inchon —a 50,000-bpd refinery to be further expanded by 20 percent late in 1972; this refinery belongs to the Kyungin Energy Development Co., Ltd., owned 50–50 by the Union Oil Co., Ltd., and Korea Explosives. At the beginning of 1972, the Republic of Korea was also putting the finishing touches to a 3,000-bpd lubricating plant at Seoul, owned jointly by the Gulf Oil Corp. and the Korea Oil Corp.

Petroleum exploration had begun in the country in recent years, consisting primarily of seismic surveys in offshore areas. As of early 1971 exploration concessions on offshore tracts that had been granted totaled 108,000 square miles. Companies involved in these concessions include Korea Shell N.V., Caltex, jointly owned by Standard Oil of California and Texaco, Wendell Phillips, and other independent companies.

The Mineral Industry of Kuwait and Saudi Arabia

By David A. Carleton[1]

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Since December 1969, the former Kuwait-Saudi Arabia Neutral Zone has been partitioned into two equal administrative areas—the northern half administered by Kuwait and the southern half administered by Saudi Arabia. Arrangements which existed prior to partitionment calling for the equal sharing of revenue from natural resources in the entire zone continued in force. Petroleum is the only major mineral activity in the partitioned zone, including its offshore area. Offshore petroleum is produced by the Japanese-owned Arabian Oil Co. Ltd. (AOC), the concessionaire for both Kuwait and Saudi Arabia. Onshore, petroleum is produced jointly by two companies, Getty Oil Co. (Getty), the concessionaire for Saudi Arabia, and American Independent Oil Co. (Aminoil), the concessionaire for Kuwait. Many of the facilities belonging to Getty are in the Kuwait-administered section; however, for the purpose of this report all Getty operations will be discussed under Saudi Arabia and all Aminoil operations will be discussed under Kuwait. Activities of AOC will also be reviewed under Kuwait.

KUWAIT

The economy of Kuwait is almost totally dependent on the petroleum industry. The country's national account shows that in 1971 the Government received 93 percent of its income from royalties and taxes paid by oil companies. The value of crude oil produced was equal to about 60 percent of the country's gross national product (GNP). Other petroleum-associated commodities include natural gas, most of which is flared, fertilizer materials from a petrochemical plant, and sulfur from crude oil refining. Nonpetroleum mineral activities, such as lime, sand, gravel, building stone, and salt production, play an insignificant role in the economy.

The slowdown in Kuwait's economy which occurred during the past several years has been blunted by the steady rise in the inflow of oil revenue. The country felt the beneficial effects of a world petroleum position which favors the petroleum exporting countries. The upward revision of crude oil prices, the increased tax rates (late in 1970), the appreciation of the Kuwaiti dinar resulting from the U.S. dollar devaluation, and the promise of increased participation of the Kuwait Government in the petroleum industry promised an optimistic future.

Infrastructural development is the principal nonmineral-associated activity in Kuwait. Electric power generating capacity was expected to increase 50 percent in 1971 and water desalination capacity was being expanded by the addition of five 5.0 million-imperial-gallon-per-day units. Kuwait, which is now the world's largest water desalination country, will have a capacity of 52 million imperial gallons by the end of 1972.

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[1] Supervisory foreign minerals specialist (petroleum), Division of Fossil Fuels.

Tensions on the Iraqi-Kuwaiti border, which have existed since 1958, were relieved by an Iraqi Government announcement in October 1971 that they were "ready to settle all outstanding issues with Kuwait, including the boundary question." The boundary problem was largely attributable to the general belief that certain oil structures crossed the border. Settlement of the boundary question should stimulate the flow of Kuwaiti investment into Iraq.

The Kuwait Government made another attempt to solve the thorny question of its offshore boundaries with Iran and Saudi Arabia. It was agreed that resolving the northern offshore boundary of the former Kuwait-Saudi Arabia Neutral Zone will have to precede negotiations with Iran. The major concern is the three-way overlap of offshore oil concessions issued by the three governments. Repeated negotiations in the past have failed to produce an acceptable compromise.

PRODUCTION

In 1971, Kuwait, by producing 3,197,089 barrels of oil per day was the world's sixth largest producer, accounting for 6.6 percent of the world's total. This output was 7 percent larger than that of 1970, a rate of increase established for the past several years. Company production in barrels per day, was as follows:

Kuwait Oil Co. Ltd. (KOC)	2,925,466
Arabian Oil Co. (AOC)	[1] 180,476
American Independent Oil Co. (Aminoil)	91,147
Total	3,197,089

[1] Kuwait's one-half share only.

Natural gas output also increased about 13 percent during the year as all the gas produced is in association with crude oil production.

Production from Kuwait's three refineries also expanded as the Kuwait National Petroleum Co. (KNPC) refinery at Shuaiba operated at or above capacity throughout the year. With the expansion of KOC's Mina al Ahmadi plant, refining output is expected to rise significantly again in 1972.

Table 1.—Kuwait: Production of mineral commodities

Commodity	1969	1970	1971 p
NONMETALS			
Fertilizer materials, manufactured, nitrogenous:			
Ammonium sulfate——metric tons	35,205	87,511	NA
Urea——do	135,146	145,981	NA
Lime, hydrated and quicklime——do	694	742	e 750
Salt——do	r 3,910	4,653	e 4,700
Sulfur——do	14,786	48,091	36,904
MINERAL FUELS AND RELATED MATERIALS			
Natural gas:			
Gross production——million cubic feet	514,563	569,679	643,053
Marketed——do	r 191,626	203,782	156,753
Natural gas liquids:			
Natural gasoline——thousand 42-gallon barrels	4,550	4,903	5,403
Liquefied petroleum gas (propane and butane)——do	12,611	12,670	13,664
Petrochemicals——metric tons	229,419	NA	NA
Petroleum:			
Crude [1]——thousand 42-gallon barrels	1,021,615	1,090,040	1,166,938
Refinery production: [2]			
Motor gasoline——do	r 3,030	r 3,495	4,302
Jet fuel——do	635	883	793
Kerosine——do	3,674	4,762	5,446
Distillate fuel oil——do	46,989	54,090	51,593
Residual fuel oil——do	52,284	72,280	76,959
Naphtha——do	4,023	6,937	8,959
Other [3]——do	5,966	9,019	169
Total——do	r 116,601	r 151,466	148,221

e Estimate. p Preliminary. r Revised. NA Not available.

[1] Includes Kuwait's one-half share of crude oil production in the former Kuwait-Saudi Arabia Neutral Zone and Kuwait's share of refinery output by its concessionaires in that area.

[2] Naphtha, previously reported with gasoline, has been listed separately in this edition; liquefied petroleum gas from gas processing plants has been excluded from detail and from refinery product total and is reported separately.

[3] Mostly asphalt and topped crude for blending.

TRADE

Kuwait improved its position among the world's exporters of crude oil. During the year Kuwait ranked fourth by passing Libya which placed restrictions on its output. Data are available on the country of destination for KOC crude oil exports only. During the year, 63 percent of KOC's crude exports went to West European countries and most of the remainder went to Far Eastern countries. The United States accounted for only 1 percent of the total. The United Kingdom and Japan received 20 and 14 percent, respectively. During a record 24-hour period in February 1971, total crude oil shipped by KOC reached 5,678,000 barrels.

Table 2.—Kuwait: Exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971
METALS			
Aluminum and alloys, unwrought and semimanufactures	11	7	NA
Copper and alloys, unwrought and semimanufactures	259	9	NA
Iron and steel:			
Scrap and unwrought	[r] 19,741	53,864	NA
Semimanufactures	[r] 19,810	9,117	NA
Lead and alloys, unwrought and semimanufactures	17	44	NA
Tin and alloys, unwrought and semimanufactures long tons	--	10	NA
Other:			
Nonferrous metal scrap, not subdivided	7,989	9,007	NA
Unwrought and semimanufactures	2	(2)	NA
NONMETALS			
Asbestos, crude	(2)	141	NA
Cement, hydraulic	[r] 14,796	7,997	NA
Clay products:			
Refractory	86	244	NA
Nonrefractory	117	274	NA
Fertilizer materials:			
Natural, crude, all types	60	--	NA
Manufactured:			
Nitrogenous	178,779	223,450	NA
Other including mixed	14,898	2,896	NA
Gypsum and plasters	62	240	NA
Lime	--	130	NA
Salt	129	3	NA
Sand and gravel:			
Sand	[r] 1,070	7,413	NA
Gravel (including crushed stone)	[r] 10	272	NA
Stone, dimension:			
Unworked:			
Marble	162	40	NA
Mosaic stones, pebbles and powder	530	159	NA
Other	100	1	NA
Worked	--	4	NA
Other: Unspecified crude minerals, chalks, colored soil, and clays	1	2	NA
MINERAL FUELS AND RELATED MATERIALS			
Coal, coke and briquets	10	--	NA
Petroleum:			
Crude thousand 42-gallon barrels	896,967	943,833	1,011,933
Refinery products:			
Gasoline do	4,232	7,354	NA
Kerosine and jet fuel do	3,157	4,562	NA
Distillate fuel oil do	34,798	41,409	NA
Residual fuel oil do	24,364	43,833	NA
Liquefied petroleum gas do	12,097	12,816	NA
Other do	6,274	[r] 6,163	NA
Total do	84,922	[r] 116,137	NA

[r] Revised. NA Not available.
[1] Includes Kuwait's share of former Neutral Zone exports.
[2] Less than ½ unit.

Table 3.—Kuwait: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum and alloys, unwrought and semimanufactures	723	1,746
Copper and alloys, unwrought and semimanufactures	273	311
Iron and steel:		
Pig iron and scrap	[r] 1,671	13,515
Semimanufactures	[r] 201,790	151,091
Lead and alloys, unwrought and semimanufactures	123	277
Nickel and alloys, unwrought and semimanufactures	72	--
Silver and platinum ..... troy ounces	--	386
Tin and alloys, unwrought and semimanufactures ..... long tons	9	7
Uranium, radium, and thorium ..... grams	1,310	964
Other:		
Nonferrous metal scrap, not subdivided	588	630
Unwrought and semimanufactures	49	26
NONMETALS		
Asbestos, crude	1,624	2,453
Cement, hydraulic	811,280	625,551
Clay products:		
Refractory	1,271	769
Nonrefractory	9,860	7,440
Diamond, gem ..... carats	1,145	1,100
Fertilizer materials:		
Crude, natural, all types	69	214
Manufactured:		
Nitrogenous	20	--
Other including mixed	10,110	66
Gypsum and plasters	5,897	4,885
Lime	25	75
Precious and semiprecious stones, except diamond ..... kilograms	26	5
Salt	2,995	3,924
Sand and gravel:		
Sand	53	200
Gravel (including crushed stone)	[r] 5,303	15,562
Stone, dimension:		
Unworked:		
Marble	6,481	6,174
Mosaic stones, pebbles and powder	41,756	30,502
Other	1,523	1,179
Worked	3,647	1,801
Other:		
Agricultural soil and clays	50	38
Unspecified crude minerals, chalks, colored soil, and clays	152	136
MINERAL FUELS AND RELATED MATERIALS		
Coal, coke and briquets	167	82
Petroleum refinery products:		
Gasoline ..... thousand 42-gallon barrels	8	8
Kerosine and jet fuel ..... do	6	1
Lubricants ..... do	[r] 163	112
Asphalt ..... do	20	78
Total ..... do	197	199

[r] Revised.

COMMODITY REVIEW

Nonmetals.—*Fertilizer Material.*—Details of the second supply contract agreed upon between Kuwait Chemical Fertilizer Co. (KCFC) and the People's Republic of China have been announced. KCFC is to supply 240,000 metric tons of urea during the 12-month period beginning about November 1971. The value of the contract was placed at US$7.98 million which averages $33.25 per metric ton. During the two previous 12-month periods, KCFC supplied 50,000 and 70,000 metric tons, respectively, to the People's Republic of China.

KCFC also signed a contract in July 1971 with the Arab Republic of Egypt to supply US$2 million worth of fertilizer material. Arrangements have been made with West European companies to supply the contracted amount to the Arab Republic of Egypt in exchange for KCFC, providing corresponding quantities of fertilizers on behalf of the West European countries to various countries bordering the Indian Ocean. Closure of the Suez Canal makes these arrangements logistically feasible.[2]

Under the terms of a contract signed on August 28, 1971, KCFC was to export 15,000 metric tons of urea to Afghanistan with delivery scheduled for October 1971. KCFC also has sales contracts with India, Pakistan, and Sudan.

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[2] Arab Oil and Gas (Beirut, Lebanon). V. 1, No. 2, Oct. 16, 1971, p. 18.

Mineral Fuels and Related Materials.—*Natural gas.*—A significant work program for improving the efficiency and reliability of KOC's gas-oil separators and distribution system began in 1971 and will continue into 1972. As part of the program additional separators have been installed at four gathering stations and new liquefied petroleum gas (LPG) condensate units have been added at three gathering stations.

Natural gas utilization increased substantially from about 510 million cubic feet per day in 1970 to about 615 million cubic feet per day in 1971. Most of the increase resulted from KOC gas injection, which rose 46 percent to 190 million cubic feet per day in 1971.

In February, the Kuwait Government and KOC initiated an agreement for a joint $35 million LPG development program. In July, however, the Government notified KOC that the plan was cancelled. Reportedly, however, the Government has not given up the idea of exploiting the gas and has chosen to implement the project with Government funds. The original project was for an LPG plant with a capacity of 600,000 to 640,000 tons per year.

During July 1971 an agreement was reached between the Kuwait Government, represented by the Ministry of Finance and Oil, and the Kuwait Oil Tanker Co. (KOTC), a firm wholly owned by Kuwaiti private investors, on the establishment of an ocean tanker company for the transport of natural gas. Reportedly, 51 percent of the proposed company's capital will be reserved for the Government and the remaining 49 percent for the Kuwait private sector.

Petroleum.—Petroleum policy issues, including petroleum company payments, highlighted petroleum industry developments during 1971. The year began with an agreement between the Persian Gulf member nations of the Organization of the Petroleum Exporting Countries (OPEC), of which Kuwait is a member, and the major international oil companies on price increases. The agreement which was finally signed in Tehran on February 14, 1971, called for an immediate increase of $0.35 in the posted price of all Persian Gulf crude oils; a limit of 55 percent tax rate to hold for 5 years; an approximate $0.10 per barrel increase in posted prices effective June 1, 1971; and a further increase of $0.10 to $0.11 per barrel on January 1 in each of the years 1973, 1974, and 1975. The agreement raises the average posted price for a barrel of 31° API crude from $1.68 to $2.09. The average income per barrel for the Government of Kuwait will increase to about $1.30 from about $0.98 in 1970.

At yearend OPEC, which had earlier in the year committed themselves to "effective participation" in existing oil concessions, were preparing to implement their resolution. Furthermore, negotiations between OPEC and the major Middle East concessionaires regarding a price increase to offset the devaluation of the U.S. dollar were scheduled for early in 1972.

Production by the country's major petroleum company, KOC, increased about 7 percent in 1971 to a record high average of 2,925,466 barrels per day, compared with 2,734,547 barrels per day the previous year. Crude oil supplied by KOC to the Shuaiba refinery of Kuwait National Petroleum Co. (KNPC) averaged 103,952 barrels per day. A new peak production rate for one day was established in January 1971 when 3,653,000 barrels were produced.

The year 1971 was a period of improvement and expansion of existing facilities. New pumps and control facilities were installed at nine gathering stations in a program to replace obsolete equipment. Installation of additional low pressure separators at two gathering stations increased the daily capacity at each by approximately 50,000 barrels.[3]

Crude oil throughput at the Mina al Ahmadi refinery of KOC averaged 224,622 barrels per day. The capacity of one distillation unit was increased to bring total refinery capacity to 292,000 barrels per day.

The sea island export terminal completed in 1968 loaded 290 tankers, one of which was the world's largest vessel, the 373,000-deadweight-ton Nisseki Maru. Studies to determine the future needs of crude oil storage and export facilities were conducted.

In view of the world trend towards increasing numbers of very large tankers, together with future crude oil demand forecasts, KOC developed plans for expanding its deepwater tanker loading facilities. The project provides for the construction of three 1-million-barrel storage tanks, a 7-mile, 66-inch gravity line from the fields to the coast, and a 10-mile, 52- or 56-inch underwater pipeline to the companies' sea island. These additional facilities will increase the present crude oil loading rate from 15,000 to 35,000 tons per hour.[4]

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[3] Kuwait Oil Co., Ltd. 1971 Review of Operations. 32 pp.

KOC voluntarily relinquished 1,152 square kilometers of concession area which included Sabbiyah peninsula, part of Bubiyan Island, and other sections. Eight development wells were completed during the year and remedial workovers were carried out at 100 wells. Preparations were made for new seismic survey work to be carried out in 1972 on promising structures at Bahrah. From the beginning of its concession through 1971, KOC drilled 754 wells, 693 of which were producible wells.[5]

KNPC which is owned 80 percent by the Government and 20 percent by private Kuwaiti capital operated its 90,000-barrel-per-day Shuaiba refinery at more than 100,000 barrels per day in 1971. During the year, the refinery ran large quantities of Burgan crude; however, near the end of 1971 it began to run substantial quantities of the heavier Umm Gudair crude for which its hydrogenation facilities were designed.

KNPC has no crude oil production of its own but does have a 51-percent interest in Kuwait Spanish Petroleum Co. (KSPC), a joint venture with the Spanish national company, Hispanica de Petroleos, S.A. (Hispanoil). The company is drilling a third exploratory well in the Western part of its onshore concession; two previous wells were dry.[6]

In the former Kuwait-Saudi Arabia Neutral Zone area, negotiations between Aminoil and the Kuwait Government concerning application of terms of the Tehran agreement on posted prices on crude oil produced in the former Neutral Zone were suspended in August 1971. The negotiations had been continuing since early in 1971 with the Government insisting on obtaining the full terms of the Tehran Agreement. Aminoil maintained that full application would render its operation uneconomic in view of the marketing problems for its heavy, high-sulfur crude oil.

AOC concluded negotiations with Kuwait and Saudi Arabian Governments on the new posted price for its production resulting from the Tehran agreement. Similar to the agreement KOC signed with the Government, the price, retroactive to February 15, 1971, increased substantially to $1.97 for 28° API Khafji crude and to $2.185 for 35° API Hout crude.

Onshore in the former Neutral Zone Aminoil increased its production a substantial 11 percent to an annual average of 93,292 barrels per day. However, during the closing months of 1971, production fell to about 60,000 barrels per day from a high of over 100,000 barrels per day earlier in the year. The decline reflects the poor marketing conditions for heavy, high-sulfur crude oil which is produced from the onshore concession. Stringent air pollution measures adopted in Japan and other industrialized nations have damaged the marketability of onshore crude oil.

The concessionaire offshore from the former Neutral Zone, AOC, recorded a modest 4-percent increase by producing an average of 360,953 barrels per day. Increases in Hout oilfield output were probably at the expense of Khafji oilfield. Whereas the former has market appeal, the latter has a high-sulfur content which restricts its marketability.

SAUDI ARABIA

The Saudi Arabian efforts to diversify its economy have not been especially successful as petroleum continues to be dominant. Although one contract has been let to a Japanese consortium to further explore a mineralized deposit in the western part of the country, no new major industrial activities have been undertaken. Plans for an aluminum plant have apparently fallen through and the prospects for a scrap iron melting and ore reduction plant are uncertain as preliminary feasibility studies reveal that the only process potentially economically viable in Saudi Arabia has not been perfected.

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[4] Middle East Economic Survey (Beirut, Lebanon). V. 15, No. 12, Jan. 14, 1972, p. 3.

[5] Work cited in footnote 3.

[6] Petroleum Press Service (London). V. 39, No. 4, April 1972, pp. 131–133.

The mineral producing and processing industry contributed 71 percent to the Saudi Arabian 1971 gross national product (GNP) of $3,555 million[7] at 1971 prices. Petroleum production and refining were pre-eminent, contributing 70 percent of total GNP whereas other mining and quarry activities accounted for the remaining 1 percent. The Saudi economy showed signs of recovering from a period of stagnancy as real GNP increased 10 percent. The rise in business activity was occasioned by the rapid rise in petroleum income and a concomitant budgetary increase. Petroleum income including royalties, taxes, and fees amounted to US$1.25 billion or 88 percent of Government income during the fiscal year ending August 21, 1971. Projected income for the fiscal year ending August 11, 1972, is $2.22 billion. This quantum jump is attributed entirely to the rise in direct income from the petroleum sector, either in the form of royalties or direct taxes, and reflects the impact of the higher tax rate agreed to between the oil companies and the Government in November 1970 and to the February 1971 Tehran agreement which calls for higher tax reference prices.

In an effort to encourage foreign investment, the Government was preparing a new set of regulations designed to regulate the exploitation of mineral resources and to provide incentives for private Saudi investment.

Payments by petroleum producers to the Government during calendar 1971 totaled US$1,944.9 million compared with $1,149.7 million in 1970. The following tabulation presents payments and unit income from the country's three producing companies—Arabian American Oil Co. (Aramco), Arabian Oil Co. (AOC), Getty Oil Co. (Getty), and other exploration concessionaires:[8]

Company	Payments (million U.S. dollars)	Unit income (U.S. cents per barrel)
Aramco	1,866.4	1.14
AOC	44.2	.63
Getty	20.6	.60
Others	13.7	--
Total	1,944.9	[1] 1.11

[1] Average for the three producing companies only.

By yearend 1971 the two concessionaires in the former Neutral Zone had not reached an agreement on the posted price; however, considering the poor marketability of much of the crude produced in that zone, the per-unit payments are not expected to increase significantly.

PRODUCTION

Saudi Arabia crude oil production increased a phenomenal 25 percent and recorded a rise which nearly reached 1 million barrels per day. The increase alone was more than the total annual production of Indonesia, the world's eleventh-ranking producer. The extraordinary growth is due to a combination of factors. The most important is a decline in transportation costs. With the reopening of the Trans-Arabian Pipeline in January 1971, a slowdown in the accumulation of oil stocks by West European countries, and the commissioning of new supertankers, tanker rates have fallen. This has made Persian Gulf crudes competitive in Western Europe with those from Mediterranean Sea outlets, and they are increasingly more competitive in the Western Hemisphere. Imports of Saudi Arabian crudes into the United States doubled in 1971.

Ghawar oilfield continues as the country's largest, accounting for 45 percent of the total and averaging during 1971 nearly 2.5 million barrels per day. Most of the increased production in 1971 occurred at onshore fields, offshore fields having, in general, a relatively high-sulfur content. As a result the onshore Abqaiq field increased production 18 percent to replace offshore Safaniyah oilfield as the second largest producer. The three above fields accounted for 80 percent of the Saudi Arabian production including that from the former Neutral Zone.

Natural gas production, all of which is produced in association (in solution) with crude oil also increased. Estimated output in 1971 was about 780 billion cubic feet, most of which was flared.

Cement production of 666,900 tons in Hejira calendar year 1390 (Mar. 3, 1970–Feb. 26, 1971) accounted for 59 per-

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[7] Where necessary, values have been converted from Saudi riyals to U.S. dollars at a rate of SRl's 4.5=US$1.00.

[8] Saudi Arabian Monetary Agency. Statistical Summary. Jedda, December 1971.

Table 4.—Saudi Arabia: Production of mineral commodities [1]

Commodity	1969	1970	1971 [p]
METALS			
Steel semimanufactures, hot rolled metric tons	NA	8,498	NA
NONMETALS			
Cement, hydraulic [2] do	[e] 550,000	651,455	[e] 655,000
Gypsum [2] do	[e] 15,000	17,231	[e] 18,000
Lime [2] do	[e] 15,000	21,620	[e] 22,000
Stone, marble do	NA	2,000	NA
Sulfur [e] do	4,000	5,000	5,000
MINERAL FUELS AND RELATED MATERIALS			
Gas, natural:			
Gross production million cubic feet	637,689	710,940	[e] 915,000
Marketed production do	[r] 93,758	104,182	NA
Petroleum:			
Crude thousand 42-gallon barrels	1,173,896	1,387,266	1,741,541
Refinery products:			
Aviation gasoline do	176	38	[3] 32,683
Motor gasoline do	25,408	[3] 34,395	
Jet fuel do	13,962	13,668	13,194
Kerosine do	3,190	6,876	5,311
Distillate fuel oil do	18,346	21,534	22,208
Residual fuel oil do	90,256	123,759	120,825
Liquefied petroleum gas do	13,251	18,218	17,860
Other do	2,414	2,730	1,073
Total do	167,003	221,218	213,154

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] Includes Saudi Arabia's one-half share of crude oil production in the former Kuwait-Saudi Arabia Neutral Zone and Saudi Arabia's share of refinery output by its concessionaires in that area.

[2] Data presented are for Hejira calendar years as follows: 1969—Hejira year 1389 (March 19, 1969—March 8, 1970); 1970—Hejira year 1390 (March 9, 1970–February 28, 1971); 1971—Hejira year 1391 (February 27, 1971–February 16, 1972).

[3] Includes naphtha.

cent of the nation's need, the highest share ever reached. During the previous year the country produced only 46 percent of its requirements.

TRADE

Crude oil and petroleum refinery products which are essentially the only mineral commodities exported by Saudi Arabia were valued at about $2.1 billion in 1971 based on realized prices. Other mineral commodities exported are semifinished and finished metal products shipped to neighboring Persian Gulf States.

Major mineral commodities imported are iron and steel semimanufactures, cement, and mineral fuels including lubricants. The total value of mineral imports in the Hejira calendar year 1388 (Mar. 30, 1968–Mar. 18, 1969) was $81 million.

Table 5.—Saudi Arabia: Exports of crude petroleum and petroleum refinery products [1]

(Thousand 42-gallon barrels)

Commodity	1969	1970	1971
Crude petroleum	1,020,055	1,174,179	1,337,450
Petroleum refinery products: [2]			
Motor gasoline	21,522	27,011	NA
Jet fuel	14,100	13,436	NA
Kerosine	1,366	4,476	NA
Distillate fuel oil	17,157	23,160	NA
Residual fuel oil	48,508	68,450	NA
Other	14,552	15,844	NA
Total	117,205	152,377	190,292

NA Not available.

[1] Includes Saudi Arabia's share of exports from the former Kuwait-Saudi Arabia Neutral Zone.

[2] Excludes exports (if any) by General Petroleum and Mineral Organization (Petromin).

Table 6.—Saudi Arabia: Exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1967–68 [2]	1968–69 [3]	1969–70 [4]
METALS			
Aluminum scrap and semimanufactures	540	323	124
Copper and alloys, all forms	868	588	940
Gold and alloys troy ounces	--	--	5,498
Iron and steel:			
Scrap	3,966	2,493	24,758
Ferroalloys	--	--	108
Semimanufactures	348	--	30
Lead, scrap	327	480	370
NONMETALS			
Cement	--	--	930
Fertilizer materials, phosphatic	--	--	50,258
Gypsum	2,197	3,343	3,751
Lime	r 669	667	786
Pigments, mineral, natural, micaceous iron oxide	--	--	1,266
Salt	--	--	1,433
Stone, crushed or broken	--	2,007	3,181
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	--	--	3,720
Petroleum:			
Crude oil thousand 42-gallon barrels	848,000	1,123,000	1,165,711
Refinery products do	r 121,000	147,000	180,664

r Revised.

[1] Excludes commodities with an export value within either year of less than 100,000 Saudi riyals. Data officially reported in Kingdom of Saudi Arabia, Statistical Yearbook.

[2] The Hejira calendar year 1387: April 11, 1967—March 29,1968.

[3] The Hejira calendar year 1388: March 30, 1968–March 19, 1969.

[4] The Hejira calendar year 1389: March 20, 1969–March 7, 1970.

Table 7.—Saudi Arabia: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum semimanufactures, plates and sheets	577	1,369
Copper semimanufactures, pipes and wire	--	311
Gold thousand troy ounces	385	1,560
Iron and steel:		
Primary forms	6,026	--
Semimanufactures:		
Bars and rods	r 100,265	109,965
Angles, shapes and sections	16,784	8,564
Sheets and plates	r 23,709	21,764
Pipes, tubes and fittings	r 70,184	39,636
NONMETALS		
Asbestos	--	823
Cement	623,305	463,741
Fertilizer materials, mineral and chemical	5,865	3,355
Lime	9,302	12,270
Stone, dimension, marble	5,761	4,216
MINERAL FUELS AND RELATED MATERIALS		
Petroleum refinery products:		
Lubricants thousand 42-gallon barrels	245	210
Other do	r 55	--

r Revised.

COMMODITY REVIEW

Regional mapping and prospecting were continued by the Directorate General of Mineral Resources (DGMR) and its foreign contractors. At Jabal Shayban and Wadi Yiba, interesting structures have revealed low-grade copper and zinc mineralization. In the same general location, a finding at Lakathah indicated local concentrations of 40 percent titaniferous magnetite.

In the Asir, a southwestern province, copper-stained quartzites, together with pigmatites containing beryl, monazite, and uraninite are being studied. Molybdenum in granite was also noticed.

At Jabal Sayid the indicated tonnage of 2.0 percent copper was increased appreciably from last year's estimate of 8 million tons by the discovery of two adjacent ore bodies. At Nuqrah drilling increased the earlier tonnage estimate of 1.5 million tons of ore graded 1.2 percent copper, 3.0 percent lead, and 9.0 percent zinc with 220 grams per ton of silver and 2 grams per ton of gold.[9]

In January 1971 DGMR disclosed that United States, French, and Japanese geological teams had been carrying out exploratory field work in the Khumrah area southeast of Mecca, Jabal Farasan north of Jidda, Al Bayadah near Jidda, and Wadi al Ashsh north of Medina. Copper, silver, phosphates, lead-zinc, iron, gypsum, marble, and silica were discovered and commercial feasibility studies were underway.[10]

The Saudi Arabian Government on July 19, 1971, granted a mineral exploration permit to an association of two firms: a Saudi corporation, National Mining Co., and a U.S. firm, Arabian Shield Development Co. The 2-year permit, the first of its kind, covers two areas in central and southwestern Saudi Arabia. Under the terms of the agreement, the two firms will carry out mineral exploration in a 40-square-kilometer bloc in the Wadi Qatam area and a 13-square-kilometer area in the Musayni'ah region. The first lies about 90 kilometers north of Najran (17°30′N–44°10′E) and the other about 35 kilometers south of Hulayfa' (26°00′N–40°47′E). The two firms will pay the Government $100 per square kilometer per year. In the event of a commercial discovery, the General Petroleum and Mineral Organization (Petromin) will choose either to participate in a joint venture to develop the discovery or assign its right to participation to private Saudi investors. The Musayni'ah bloc contains an ancient copper mine, assays from which indicate the occurrences of copper, gold, and zinc in addition to small amounts of silver and lead. Geological and geophysical surveys and test drilling in Wadi Qatam have shown the existence of substantial quantities of iron disulfide ore (pyrite).[11]

Metals.—*Copper.*—It was reported in 1971 that the Saudi Arabian Government and a consortium of three Japanese mining firms were planning to conclude a contract for joint prospecting and development of copper, lead, zinc, and other nonferrous metal deposits in Saudi Arabia. According to Nippon Mining Co., who together with Mitsui Mining and Smelting Co. and Mitsui Co., have joined the venture, the Saudi Arabian Government has spent $20 million annually in recent years on prospecting for nonferrous metals in two areas north of Jidda. As a result of several bore holes, promising copper deposits were discovered in the As Safra district and promising silver, lead, and zinc deposits were found in the Nuqrah district. The draft contract contained three main points: (1) the three companies would be granted exclusive prospecting and development rights in both districts; (2) the term of the concession would be 30 years; and (3) a joint company would be formed with the Saudi Arabian Government, and more than 50 percent of its capital would be put up by the Japanese companies.[12]

At yearend 1971 an agreement between the Government and the companies had not been reached; however, the project was considered viable.

Iron and Steel.—During the year Petromin held numerous discussions with interested parties concerning the possible joint-venture construction of a scrap melting facility and ore reduction plants. Both would be at Dammam in the Eastern Province and the facility would have a capacity of up to 250,000 tons per year. Preliminary feasibility studies have been prepared. One of the processes being considered is the HyL (Hojalata y Lámina) process developed in Mexico but not yet fully perfected. Electricity for the scrap melting furnace would be provided by gas-powered electric turbines. With natural gas available at a minimum cost, the proposal appears to be economically feasible. Scrap used by the plant would be imported which would be cheaper than collecting it in Saudi Arabia. Concerning the ore reduction plant, Petromin will probably delay a decision on what type to install for several years or until certain technical difficulties in the HyL process are overcome.

Nonmetals.—*Cement.*—The Ministry of Commerce and Industry has authorized the establishment of a plant for fabricating cement and marble products and tiles. The Saudi Arabian Government will participate in 25 percent of the capitalization which will amount to about $100,000.[13]

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[9] World Mining. V. 7, No. 7, June 25, 1971, p. 91.

[10] Mining Annual Review (London). June 1971, p. 377.

[11] Middle East Economic Survey (Beirut, Lebanon). V. 14, No. 41, Aug. 6, 1971, p. 6.

[12] Japan Metal Bulletin (Tokyo). No. 2653, Feb. 18, 1971, p. 5.

Fertilizer Materials.—The $40 million Damman fertilizer complex of the Saudi Arabian Fertilizer Co. (Safco) started full commercial production in January 1971 and continued through mid-March 1971 when it was shutdown for several months for the replacement of faulty equipment. During the periods the plant was in full operation, maximum output was only 60 percent of capacity.

In September 1971 Safco introduced a program to improve plant output. The program, which is under the technical supervision of Occidental Petroleum Corp. through its subsidiary, International Ore and Fertilizer Corp., is to increase production to 80 percent and eventually to 100 percent of capacity.

Plans for the construction of a 200,000-ton-per-year sulfur plant to be built at Damman by Occidental Petroleum Corp. have been dropped. Depressed world sulfur prices were given as the reason for scuttling this project.

Mineral Fuels and Related Materials.—*Petroleum and Natural Gas.*—During 1971 Saudi Arabia overtook Iran to become the world's third largest crude oil producing country, averaging 4,771,344 barrels per day. This was accomplished by the extraordinary 27-percent increase in offtake by Aramco. Production by company during the year, in barrels per day, was as follows:

Aramco	4,497,576
AOC	[1] 180,476
Getty	93,292
Total	4,771,344

[1] This amount is one-half of the amount produced by this company in the former Neutral Zone.

During July 1971 the Ministry of Petroleum and Mineral Resources invited bids from international oil companies for two areas in the central part of the country. The areas are essentially part of Aramco's former preferential area, the last part of which was relinquished in 1963. Following the relinquishment, intensive seismic, gravimetric, and magnetic surveys and surface geologic work were carried out by the government. It was subsequently reported that two very promising structures were located northeast and southeast of Riyadh. The two opened areas measure 62,400 and 62,600 square kilometers, respectively.

Later in the year the West German consortium Deutsche Endölversorgungsgesellschaft, m.b.H. (Deminex), confirmed that it was studying the possibility of submitting a joint bid with the Japanese Petroleum Development Corp. Other firms, including several of the major international oil companies, have indicated an interest in the area.[14] However, when bids were closed on December 15, 1971, only three bidders reportedly made offers. These were Mobil Oil Co., Occidental Petroleum Corp., and a Japanese–U.S. group consisting of the Japanese Petroleum Development Corp., Sun Oil Co., and Cities Service Co. Contracts are expected to require winners to provide a 50-percent participation option to the Government upon discovery of a commercial find.[15]

Aramco.—Principal seismic surveys were carried out by two crews which obtained deep formation data in the central and far eastern Rub Al-Khali. A third crew obtained near-surface data along the Persian Gulf shore area and a marine seismic survey was completed in the Marjan-Zuluf area.

The first wildcat exploration well drilled in each of the Mazalij and Harmaliyah areas discovered oil, bringing to 20 the number of proved oilfields in Aramco's concession area. The former was reported to be 45 miles long and 8 miles wide and described as a "giant" field with reserves equal to those of the Ghawar field, the world's largest. Eight development rigs drilled 56 wells during the year for oil production, pressure maintenance, and water injection.

Natural gas and nonpotable water continued to be injected into oil reservoirs and aquifers under the pressure maintenance program but at a reduced rate compared with 1970. Methane from associated natural gas was injected at a rate of 273.5 million cubic feet daily into the Abqaiq field and the Ain Dar section of the Ghawar field. Nonpotable water was injected into the Abqaiq, Ghawar, and Khursaniyah fields at a rate of about 3.2 million barrels per day.

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[13] Cement Lime and Gravel (London). V. 47, No. 2, February 1972, p. 39.

[14] Middle East Economic Survey (Beirut, Lebanon). V. 15, No. 1, Oct. 29, 1971, p. 7.

[15] Oil and Gas Journal. V. 70, No. 1, Jan. 3, 1972, p. 21.

The rapid rise in production was accompanied by an accelerated construction program. Twenty-two wells were linked to new gas-oil separator plants and 22 other wells were connected to a two-stage separator and a satellite separator. Furthermore, 159 miles of oil pipelines were placed in service by Aramco, including 80 miles of major trunklines, 70 miles of oilfield gathering lines, a 6-mile Ras Tanura refinery—terminal transfer line, and a 2.5-mile underwater line to the offshore loading terminal. The trunklines ranged from 16 to 42 inches in diameter. The pipeline division of Mothercat, Ltd., a Lebanese company, announced in November 1971 that it has been awarded a contract to construct 155 miles of pipeline as part of Aramco's pipeline construction program.

Stabilization capacity was increased by 500,000 barrels per day and the company's second 1-million-barrel storage tank was completed at Ras Tanura.

Crude oil processed at Ras Tanura declined slightly (4 percent) to an average of 558,853 barrels per day; no explanation has been given. Cargos of crude oil and refined petroleum products totaling 1,433.0 million barrels were loaded on 3,407 tankers at Ras Tanura. At yearend the tanker F. A. Davies was ready for operation as a floating storage vessel at a new ship-loading terminal near completion 40 miles offshore. The 230,000-deadweight-ton (d.w.t.) vessel has a capacity of 1.8 million barrels and will be the largest ship ever used for transfer storage. The new offshore terminal is capable of handling most fully loaded tankers.

Trans-Arabian Pipeline (Tapline) service to the Mediterranean Sea, which was halted May 3, 1970, when the line was damaged inside Syria, resumed January 29, 1971, soon after Syria granted permission to make repairs. Deliveries by Aramco to Tapline facilities at Qaisumah totaled 129.1 million barrels, second only to 1968 in total annual deliveries.[16]

Petromin.—Petroship, the tanker subsidiary of Petromin, contracted in May to purchase two 40,000-d.w.t. tankers for transporting crude oil from Ras Tanura on the Persian Gulf to Jidda on the Red Sea. The previous month Petroship took delivery of its first tanker, the 26,000-d.w.t. "Tayiba," which is presently carrying crude oil from Ras Tanura to Jidda.

In addition, Petromin approved allocations in its 1971–72 budget for the following refinery and pipeline projects:

1. Construction of a 15,000-barrel-per-day refinery near Riyadh at a cost of US$22.23 million which is to be financed by private Saudi investors as well as Petromin. The refinery will use as feedstock crude oil from Aramco's Khurais field supplied by a 160-kilometer, 12-inch pipeline. Output of the plant is expected to consist of the following products in barrels per day: Regular gasoline, 5,572; premium gasoline, 1,420; kerosine, 1,857; distillate fuel oil, 5,332; and liquefied petroleum gas, 1,017. It will meet the requirements of the Central Province, which is now being supplied by Aramco's Ras Tanura Refinery.
2. Expansion of the capacity at the Jidda refinery from the current 12,000 barrels per day to 45,000 barrels per day to meet the increasing demand in the Western Province. Crude oil will be delivered from Ras Tanura.
3. Construction of a 288-kilometer, 14-inch pipeline to transport about 70 million cubic feet per day of 'Uthmaniyah associated natural gas for use in power generation and for industrial and domestic purposes. The cost of the project is estimated at $22.23 million. At yearend 1971 Petromin was negotiating with the Japanese firm Mitsubishi Heavy Industries. Reportedly the discussions involved a $127 million barter arrangement whereby the Japanese would build the two refineries in exchange for crude oil.[17]

The Petromin Lubricating Oils Co. (Petrolub), a joint venture between Petromin (71 percent) and Mobil Oil Investments (29 percent), began production during September 1971, from its new 75,000-barrel-per-year lube blending plant adjacent to the Jidda refinery. The $1.5 million plant contract, which was awarded in March 1970 to Saudi Arabian and Lebanese contractors, will produce lubes for local consumption.

Agip Saudi Arabia, S.p.A. (Agip), an affiliate of the Italian State Petroleum Agency, Ente Nazionale Idrocarburi (ENI), drilled a well in the Rub al-Khali where it found noncommercial oil. Agip, which is operator for a joint venture with

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[16] Arabian American Oil Company. A Review of Operations—1971. Pp. 2–3.

[17] Middle East Economic Survey (Beirut, Lebanon). V. 14, No. 28, May 7, 1971, p. 7.

Phillips Petroleum Co., also drilled another well near Hofuf. By yearend 1971 the well had not reached the target depth.

Arabian Sun Oil Co., which is the operator and majority interest holder (60 percent) in a partnership consisting of the Pakistani State agency, Oil and Gas Development Corp., and three small U.S. firms, drilled its first well, Ghawwas No. 1, 16 kilometers offshore in the Red Sea. The well was abandoned at a depth of 11,371 feet because of mechanical difficulties; no hydrocarbons were encountered. More geophysical and geological work is to be done before resuming drilling.[18]

On March 30, 1971, Lebanese and Saudi Arabian officials signed an agreement in principal whereby the two countries would jointly establish a third refinery in Lebanon to be owned equally by the respective governments. The agreements call for the refining of Saudi Arabian crude. The Saudi Arabian Government will provide the necessary funds, while the Lebanese Government's share of the capital will be paid by deducting its interest-free profit. It was decided that a full technical and economic evaluation project should be undertaken.

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[18] Petroleum Press Service (London). V. 38, No. 12, December 1971, p. 447.

The Mineral Industry of Liberia

By Henry E. Stipp [1]

The mineral industry of Liberia generally experienced gains in 1971 despite a decrease in world demand for iron ore, concentrate, and pellets. The mining of iron ore for export constitutes the major function of Liberia's mineral industry. Estimated value of iron ore production in 1971 was about $175 million,[2] almost 53 percent of the gross national product (GNP) estimated at $331 million. Other important mineral commodities produced in 1971 were diamond, valued at $5.7 million, and petroleum refinery products, valued at $16.6 million. The total value estimated for mineral industry production was about $186 million.

Expansion of iron ore production facilities was going forward at several locations. Liberian American-Swedish Minerals Co. (LAMCO) proceeded with new mine development to bring on stream an additional 1.5 million tons per year of iron ore output by early 1973. Expansion of facilities by LAMCO represented an investment of $7.2 million. Two other iron ore projects were in the final stages of investigation prior to exploitation. One was at Bie Mountain, about 22 miles northwest of Bomi Hills, where Liberia Mining Co. (LMC) continued mineral exploration activities. The other was at the Wologisi deposit in northeastern Liberia, where Liberian Iron and Steel Corp. (LISCO) proved additional reserves of iron ore. Bong Mining Co. (DELIMCO) continued its mineral exploration in the Putu Mountains of southern Liberia, but there was no activity towards exploiting the iron ore deposits. National Iron Ore Co. Ltd. (NIOC) received loans totaling over $5.3 million to finance construction of a concentration plant, install new loading and stockpiling facilities at the port in Monrovia, and obtain additional mine and railway equipment. At yearend, NIOC announced signing a contract with the Royal Netherlands Blast Furnace and Steelworks (Hoogovens) for the sale of 12 million tons of iron ore over a 10-year period. Shipments will start in 1973.

Three companies, Union Carbide Petroleum Co., Chevron Oil Co. Liberia, and Frontier Liberian Oil Co., began drilling for crude oil in offshore concession areas. The firms spent about $7 million, and results obtained were reportedly optimistic.

The Government of Liberia continued its policy of examining mineral concession agreements granted to foreign firms to certify that the terms of agreement were favorable for Liberia. Topographic mapping activities were carried out by Government and foreign aid organizations in the Cavalla River basin of southeastern Liberia. United Nations Development Program continued its mineral exploration activities in central and western Liberia. The project, which began at yearend 1969, was expected to continue for 3 years.

PRODUCTION AND TRADE

Production of mineral commodities increased 2 percent in value to an estimated $186 million in 1971, compared with $183 million in 1970. Iron ore production, depressed by world economic conditions, increased slightly to 24.6 million tons, compared with 23.7 million tons in 1970.

Gold production was estimated to have decreased as small miners turned their attention to diamond mining. Accurate figures on gold production are unobtainable because an unknown quantity of gold is bought locally for jewelry manufacture. Production of diamond decreased 9 percent compared with output in 1970. Liberian Swiss Mining Corp. (LISWIMCO) introduced a new method of diamond mining using trained divers to gather diamond-bearing gravels in the Lofa River. Machinery was being reconditioned; however, the company was handicapped by lack of working capital, and production has been disappointing.

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[1] Physical scientist, Division of Ferrous Metals.
[2] Liberia uses U.S. dollar currency.

Table 1.—Liberia: Production of mineral commodities

Commodity [1]		1969	1970	1971 p
METALS				
Gold [2]	troy ounces	1,136	669	2,547
Iron ore	thousand metric tons	22,866	23,661	24,574
NONMETALS				
Cement, hydraulic	do	r 73	88	e 90
Diamond: [3]				
Gem	thousand carats	562	577	517
Industrial	do	184	235	222
Total	do	746	812	739
MINERAL FUELS AND RELATED MATERIALS				
Petroleum refinery products:				
Gasoline, motor	thousand 42-gallon barrels	383	464	470
Jet fuel	do	76	170	89
Kerosine	do	91		87
Distillate fuel oil	do	639	917	1,166
Residual fuel oil	do	638	1,201	1,585
Other	do	4	116	133
Refinery fuel and losses	do	203	281	216
Total	do	2,034	3,149	3,746

e Estimate. p Preliminary. r Revised.

[1] In addition to the commodities listed, a variety of crude construction materials such as clays, stone, and sand and gravel were undoubtedly produced, but available information is inadequate to make reliable estimates of output levels.

[2] Purchases by the Bank of Monrovia.

[3] Exports for fiscal year ending August 31 of that stated.

Table 2.—Liberia: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum metal unwrought including alloys	--	2	All to Ivory Coast.
Iron and steel:			
Ore and concentrate..thousand tons	20,598	23,561	West Germany 5,378; Netherlands 4,616; Italy 4,507.
Semimanufactures	8	28	Italy 13; Guinea 12; United States 2.
Nonferrous metal scrap n.e.s	2,888	2,307	Italy 1,829; West Germany 220; Norway 165.
NONMETALS			
Cement	98	147	All to Guinea.
Clay products	--	14	Do.
Diamond, industrial..carats	835,952	825,959	Belgium-Luxembourg 472,989; United Kingdom 257,080; Israel 44,696.
Salt	41	1,524	All to Guinea.
MINERAL FUELS AND RELATED MATERIALS			
Gas, hydrocarbon, manufactured..value	$2,640	--	
Petroleum refinery products:			
Gasoline..42-gallon barrels	12	--	
Gas oil..do	1,000	33	All to Ivory Coast.
Residual fuel oil..do	159	--	
Lubricants..do	260	31	Mainly to Guinea.
Bitumen and mineral mixtures..do	6	--	

Source: Department of Planning and Economic Affairs, Republic of Liberia; External Trade of Liberia, Exports 1969 and 1970, Monrovia, Liberia 1970.

Table 3.—Liberia: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum:		
Oxide and hydroxide	35	1
Metal semimanufactures including alloys	124	119
Arsenic trioxide, pentoxide and acids	r 3	--
Copper semimanufactures including alloys	26	33
Gold troy ounces	4,406	3,274
Iron and steel:		
Scrap	6	--
Pig iron and ferroalloys	17	68
Ingots and other primary forms	331	324
Semimanufactures	17,343	18,347
Lead including alloys, all forms	29	73
Mercury 76-pound flasks	3	13
Platinum-group metals including alloys, all forms troy ounces	2	--
Silver:		
Silver and platinum ore value	$657	--
Metal including alloys, all forms troy ounces	260	513
Tin metal including alloys, all forms long tons	(1)	2
Zinc metal including alloys, all forms	42	--
Other:		
Oxides, hydroxides and peroxides of metals n.e.s	51	99
Metals including alloys, all forms:		
Alkali, alkaline earth and rare-earth metals	40	76
Rare metals including alloys, all forms n.e.s	5	2
NONMETALS		
Abrasive materials, natural:		
Pumice, emery, etc value	$9	--
Infusorial earths	--	2
Grinding and polishing wheels and stones	653	45
Asbestos, crude	87	37
Cement	4,383	19,789
Clay products, refractory and nonrefractory including nonclay brick value	$168,406	$301,634
Diatomite	--	2
Fertilizer materials:		
Natural:		
Nitrogenous	157	232
Phosphatic	36	13
Potassic salts	5	34
Manufactured:		
Nitrogenous	4,597	5,068
Phosphatic, basic slag	619	339
Potassic	185	--
Mixed	217	687
Ammonia	1,028	1,564
Gypsum and plaster	45	4,276
Lime	1,077	528
Pyrite (gross weight)	35	--
Salt	1,916	3,049
Sodium and potassium compounds:		
Caustic soda	1,155	2,375
Caustic potash	10	54
Stone, sand and gravel:		
Dimension stone:		
Crude and partly worked, mainly calcareous	2,339	895
Worked	80	60
Gravel and crushed rock	3,608	6,926
Limestone, except dimension	17,779	17,684
Sand	--	255
Sulfur:		
Elemental	114	1
Sulfur dioxide	1	9
Sulfuric acid	42	56
Other:		
Refractory minerals, clays, graphite, dolomite, and magnesite	r 15,994	22,425
Slag, dross and similar waste not metal bearing	--	269
Building materials of asphalt, asbestos and fiber cement and unfired materials value	r $155,402	$309,634
Other crude minerals	10	40,830
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	325	27
Carbon black and gas carbon	13	1
Coal, coke and briquets	671	5,524
Gas, hydrocarbon, manufactured value	$21,495	$57,144
Petroleum:		
Crude and partly refined thousand 42-gallon barrels	917	1,381
Refinery products:		
Gasoline do	r 49	12
Kerosine and jet fuel do	r 13	(1)
Distillate fuel oil do	144	101

See footnotes at end of table.

Table 3.—Liberia: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity		1969	1970
Petroleum—Continued			
Refinery products—Continued			
Gas oil	thousand 42-gallon barrels	r 21	32
Residual fuel oil	do	127	306
Lubricants	do	r 36	93
Mineral jelly and wax	do	1	(1)
Other	do	6	7
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals		41	22

r Revised.

[1] Less than ½ unit.

Source: Department of Planning and Economic Affairs, Republic of Liberia; External Trade of Liberia, Imports 1969 and 1970, Monrovia, Liberia 1970.

COMMODITY REVIEW

METALS

Aluminum.—A $500,000 aluminum fabricating plant was being constructed with the backing of Belgian financial interests. Reportedly, significant quantities of aluminum materials would be purchased from the United States.

Iron Ore.—Expansion of production facilities continued in 1971 despite the drop in demand for iron ore on world markets. Decreased requirements for ore, concentrate, and pellets resulted from a reduction of about 7 percent in 1971 output of crude steel in the western world. Free world production of pig iron also fell sharply. Liberian iron ore producers cut mine output in the last half of 1971 to bring about a better balance between stocks and shipments, owing to the accumulation of large stockpiles at the ports. Stocks were reduced by yearend; however, total production of ore, concentrate, and pellets increased 3.8 percent above that of 1970.

Quantity and type of material produced by the four mining firms is shown in the following tabulation, in thousand metric tons:

	1970	1971
Liberia Mining Co.:		
Lump ore	1,064	962
Fines	r 917	846
Concentrates	847	906
Bong Mining Co.:		
Concentrates	5,267	5,407
Pellets	--	1,297
Liberian American-Swedish Minerals Co.:		
Run-of-mine ore	r 770	--
Lump ore	4,118	4,018
Fines	5,046	5,309
Pellets	1,848	2,104
National Iron Ore Co.:		
Lump ore	1,509	1,468
Fines	2,274	2,256

r Revised.

Source: U.S. Embassy, Monrovia, Liberia. State Department Airgram A-93, April 29, 1972.

Shipments of iron ore in 1971 by individual company and country of destination are shown in the following tabulation, in thousand metric tons.

	LMC	NIOC	Bong	LAMCO	Total
Belgium-Luxembourg	--	72	--	951	1,023
France	162	456	--	509	1,127
Germany, West	100	870	3,236	2,245	6,451
Italy	--	468	1,581	1,064	3,113
Japan	--	--	--	3,065	3,065
Netherlands	1,134	1,121	--	--	2,255
United Kingdom	24	875	13	--	912
United States	107	145	--	1,872	2,124
Others	240	32	--	309	581
Total	1,767	4,039	4,830	10,015	20,651

Source: U.S. Embassy, Monrovia, Liberia. State Department Airgram A-93, April 29, 1972.

LAMCO was planning to develop an ore body at Mount Tokadeh about 12 miles south of the Yekepa deposit and a few miles from the company's rail line. Magnetite ore from the new deposit would supply about 1.5 million tons per year of washed fines for mixing with ore from the Yekepa mine. The expansion would cost about $7.2 million.[3] Present plans indicate a gradual increase in Mount Tokadeh production to maintain overall output levels as the Yekepa deposit becomes depleted.

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[3] Skillings' Mining Review. Lamco Joint Venture. V. 60, No. 33, Aug. 14, 1971, p. 6.

Reserves at Mount Tokadeh were estimated at 150 million tons, of which 100 million tons reportedly contained 53 percent iron.

In April 1971, NIOC announced the start of an $8 million expansion project, which is expected to extend the life of its Mano River mine by about 12 years. By yearend the company had started constructing a concentrating plant. This facility will permit the exploitation of low-grade (about 45 percent) ore thus increasing reserves to about 200 to 250 million tons. The capacity of the mine and plant will be expanded by 1 million tons per year to yield total production of 5 million tons annually of high-grade fines.[4] New railroad equipment, which consists of 55 ore cars and two mainline locomotives of 1,650 horsepower, will be added to present equipment. At the port of Monrovia a second car dumper, a larger ore storage area, and improved shiploading capacity will be provided.

To supplement production from the Bomi Hills mine, which will be depleted in 1973, Liberia Mining Co. (LMC) was developing a small deposit within its concession area. At full operation the deposit would supply ore to the plant for about 3 months. Ore will be hauled by truck to the Bomi Hills plant for processing. The company also was installing a magnetic separator to process tailings. Work continued on the Bie Mountain deposit. A drilling program was conducted, and geological exploration of the taconite-type ore was in progress.[5] LMC was negotiating with the Government for mining rights to the Bie deposit; however, the talks reportedly were stalled awaiting a court decision on whether LMC or NIOC owned prior concession rights to the deposit.

LISCO continued work on measuring reserves of iron ore in the Wologisi Range of northwestern Liberia. Further exploration was made possible by an agreement between Liberian International American Corp. (LIAC) and two Japanese companies, C. Itoh and Co. Ltd. and Nissho-Iwai Co. Ltd. LIAC received $1 million from the Japanese group in return for participating in LIAC's equity capital and an option to purchase a 51-percent controlling interest in the corporation. LIAC owns 80 percent of the stock of LISCO, which was granted the concession in the Wologisi area by the Liberian Government. The Japanese companies also agreed to purchase at least 60 percent of LISCO's annual output of iron ore for 20 years.[6]

In November two other Japanese firms, Marubeni-Lida Co. Ltd. and Toyo Menka Kaisha Ltd., joined the original group. An additional $550,000 was appropriated to help further technical studies for the construction of railway and harbor facilities. Reportedly, LIAC received information from Krupp Rohstoffe, G.m.b.H. of Germany that indicated reserves at three locations in the Wologisi area totaled 727 million tons of iron ore, which could be concentrated to 65 to 67 percent iron. LISCO had four drilling rigs operating and drilled a total of 62,000 feet. The company also had constructed 110 miles of roads in the Wologisi area. Facilities were being constructed to accommodate 100 engineers, geologists, drillers, and other personnel. Another camp for 2,500 local laborers and their families also is available about 3 miles from the first camp.

DELIMCO started up its new $45 million pelletizing plant, located at the Bong mine in central Liberia, early in 1971. In April, the first shipment of pellets, 27,000 tons, left Liberia for Italy. The plant had a production capacity of 150,000 tons of pellets per month.

Liberia's only steel fabricating plant completed an expansion program and was manufacturing and distributing a variety of steel products throughout Liberia.

NONMETALS

Barite.—Dresser Industries Inc. of the United States holds the exploitation concession on barite deposits located in grand Bassa County. The company was exploring its concession area in order to find new barite veins. Work completed in 1969 confirmed the high quality of the barite reported by the Liberian Geological Survey and the U.S. Geological Survey. However, quantity found so far was less than that expected.

Diamond.—LISWIMCO was working gravels in the Lofa River using an airlift method assisted by trained divers. Technical improvements of the system were being studied with a view to improving the quantity of diamond-bearing gravels recovered. Production has been hampered by a lack of working capital. Four other firms were operating in various concession areas, but results of their activities were not reported.

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[4] Skillings' Mining Review. National Iron Ore Co. Ltd.'s Mano River Mine. V. 60, No. 37, Sept. 11, 1971, p. 1.

[5] Skillings' Mining Review. Liberia Mining Co. Ltd. V. 60, No. 41, Oct. 9, 1971, p. 12.

[6] World Minerals. Liberia. No. 1, May–June 1971, p. 22.

Kyanite.—A deposit of several million tons of commercial-grade kyanite was discovered in 1961 in the Mount Montro area, 14 miles north of Buchanan. The Liberian Geological Survey and the U.S. Geological Survey studied the deposit and reported results of their work in the Liberian Geological Survey's Bulletin No. 2, 1968, and Memorandum Report 35, 1968. Cost of mining the deposit by open pit method was estimated at $400,000.

MINERAL FUELS

Petroleum.—In February, Union Carbide Petroleum Co. started drilling in 225 feet of water about 13 miles offshore opposite the estuary of the Lofa River.[7] The well was plugged and abandoned in April after reaching a depth of 5,515 feet with no commercial showings. In July a second well was started offshore about 23 miles south of Monrovia. In March, the Frontier Liberian Oil Co. started drilling a well in 216 feet of water located at 5°16′ N latitude and 9°39′ W longitude. The well penetrated sands of Cretaceous and Paleozoic age to a depth of 10,399 feet, but was abandoned after no commercial oil accumulations were found. Chevron Oil Co., Liberia started its first well in 302 feet of water about 30 miles southwest of the Farmington River near Marshall. The well was abandoned after reaching a depth of 9,624 feet with no commercial showings of oil or gas. Crystal Oil Co. obtained an exploration and working option on a 1,544-square-mile offshore area D–1, originally granted to Aracca Petroleum Co. An affiliate of Indiana Standard Oil Corp. obtained a 50-percent interest in a 1,158-square-mile offshore concession, originally granted to Frontier Liberian Oil Co. and Union Carbide Corp.

In August the refinery of the Liberia Refining Co. was closed for several days by two wildcat strikes. Despite the strikes, output value increased 26.7 percent compared with that of 1970. The $17.5 million plant has a daily throughput capacity of 10,000 barrels. Two hundred and seventy persons are employed in the plant, which produces liquefied petroleum gas, premium and regular gasoline, jet fuel, kerosine, diesel fuel, heavy fuel oils, and Bunker C oil.

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[7] U.S. Embassy, Monrovia, Liberia. State Department Airgram A–26, Feb. 8, 1972, p. 1.

The Mineral Industry of Libya

By Roman V. Sondermayer[1]

Although liquefied natural gas (LNG) exports started during 1971, Libya's economy remained dominated by the production and export of crude oil. However, Libyan authorities have taken steps to expand the country's mineral base. Exploration for various minerals, mostly nonmetallics, and preliminary studies for the development of an iron and steel industry were underway at yearend.

Major mineral industry events in Libya included the completion of negotiations between the petroleum companies and the Libyan Government on crude oil and LNG prices and taxes, the nationalization of British Petroleum (BP) Exploration Co. (Libya), Ltd. (BP Libya) holdings, a decline in drilling for and production of crude oil, and the expansion of a cement plant near Benghazi.

As a result of recent Government actions and the conflict between the Government and the companies, a general atmosphere of "wait and see" prevailed throughout the year. The Government continued to tighten its grip on companies operating in Libya by overseeing company financial and accounting procedures and by restricting the company's right to arbitration. In addition, the issuance of different permits were delayed and the exchange rate of the dinar was increased for calculating companies monthly payments.

PRODUCTION

During 1971 crude oil output averaged about 2.7 million barrels per day compared with 3.2 million barrels per day in 1970. Primary reasons for the decline were restrictions on crude oil production imposed by the Government and lower tanker rates, which made long-haul oil from the Persian Gulf more competitive in Western Europe and the Western Hemisphere. The following tabulation shows monthly crude oil production during 1971.

Month	Thousand barrels
January	97,124
February	86,830
March	92,634
April	87,134
May	90,163
June	82,314
July	80,947
August	79,388
September	77,967
October	77,360
November	78,435
December	76,486

Source: Petroleum Press Service. V. 39, No. 3, March 1972, p. 116.

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[1] Petroleum engineer, Division of Fossil Fuels.

Table 1.—Libya: Production of mineral commodities

Commodity [1]	1969	1970	1971 [p]
NONMETALS			
Cement hydraulic [e] ... thousand metric tons	50	100	100
Gypsum [e] ... do	15	15	15
Salt [e] ... do	16	16	16
MINERAL FUELS AND RELATED MATERIALS			
Gas, natural, gross production [2] ... million cubic feet	666,525	710,000	582,000
Petroleum:			
Crude ... thousand 42-gallon barrels	1,134,352	1,209,314	990,880
Refinery products:			
Gasoline ... do	762	733	NA
Kerosine and jet fuel ... do	364	319	
Distillate fuel oil ... do	861	828	
Residual fuel oil ... do	1,160	1,115	
Refinery fuel and losses ... do	166	190	
Total ... do	3,313	3,185	NA

[e] Estimate. [p] Preliminary. NA Not available.

[1] In addition to the commodities listed, construction materials such as sand, gravel, crushed stone, brick and tile are produced, but information is inadequate to make reliable estimates of output levels. Natural gas liquids are also produced but are blended with crude oil and are reported as a part of that total.

[2] Virtually all flared or reinjected through 1970.

TRADE

The foreign trade of Libya was dominated by exports of crude oil. The European Economic Community (EEC) countries continued to be the principal purchasers of Libya's crude oil during 1970, the latest year for which data are available. During 1970 United States imports of Libyan crude were 38.5 percent lower than those of 1969. The figures for other commodities in Libya's trade were derived from trade books of countries that traded with Libya in 1969, the latest year this type of information was available. Equipment and material for drilling from industrialized countries were the major import items.

Table 2.—Libya: Crude oil exports by countries

(Thousand 42-gallon barrels)

Country	1968 [r]	1969 [r]	1970 [p]
Belgium-Luxembourg	30,326	43,866	46,866
Brazil	1,542	2,330	(1)
Canada	--	3,829	--
Denmark	8,873	10,034	8,687
France	75,327	130,820	158,811
Germany, West	260,184	252,794	250,463
Greece	--	2,183	(1)
Italy	183,238	252,689	294,300
Japan	(1)	(1)	2,920
Netherlands	68,415	110,936	110,376
Netherlands Antilles	1,261	795	(1)
Norway	10,447	7,657	5,950
Romania	1,180	3,925	438
Spain	56,848	59,241	53,509
Sweden	482	2,397	(1)
Switzerland	8,056	11,505	17,885
Trinidad and Tobago	6,323	8,739	17,557
Tunisia	(1)	1,158	--
Turkey	4,024	1,918	4,088
United Kingdom	171,956	154,541	179,982
United States	53,230	58,086	34,310
Yugoslavia	1,963	1,485	146
Other	1,469	202	[2] 27,629
Total	945,144	1,120,630	1,208,917

[r] Revised. [p] Preliminary.

[1] Shipments, if any, included in other.

[2] Of this total, 16,461,000 barrels was destined for Latin American countries other than Trinidad and Tobago, and 11,168,000 barrels was destined for unspecified West European countries other than those listed individually.

Table 3.—Libya: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1968	1969
EXPORTS		
Metals:		
Iron and steel:		
Ore	138	--
Scrap	3,865	4,960
Uranium ore	--	10
Nonferrous metals:		
Ore and concentrate	93	--
Scrap	567	787
Nonmetals:		
Gypsum and plaster	25	--
Sulfur	111	--
Crude minerals, not further described	--	10
Mineral fuels and related materials:		
Petroleum, crude ... thousand 42-gallon barrels	945,144	1,120,630
REEXPORTS		
Metals: Iron and steel semimanufactures	1,988	--
Nonmetals:		
Cement	5	--
Stone, paving ... kilograms	--	145
Mineral fuels and related materials:		
Petroleum refinery products:		
Gasoline ... thousand 42-gallon barrels	305	1,371
Kerosine ... do	138	63
Distillate fuel oil ... do	760	930
Residual fuel oil ... do	67	--
Total ... do	1,270	2,364

Table 4.—Libya: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1968	1969	Principal sources, 1969
METALS			
Aluminum including alloys, unwrought and semimanufactures	1,799	1,868	Italy 1,328; Lebanon 143.
Copper including alloys, unwrought and semimanufactures	1,172	835	Italy 197; U.S.S.R. 169; France 146.
Iron and steel:			
Ore and concentrate	2	3,020	Tunisia 2,300; Greece 720.
Scrap	5	46	United States 35.
Pig iron and ferroalloys	14	75	Italy 57; France 14.
Steel, primary forms	481	1,567	Belgium-Luxembourg 366; U.S.S.R. 312; Netherlands 175.
Steel semimanufactures	310,714	254,449	Japan 32,233; United States 29,557; Italy 27,588; U.S.S.R. 23,370.
Lead including alloys, unwrought and semimanufactures	499	607	Netherlands 127; West Germany 126; Tunisia 120.
Nickel including alloys, unwrought and semimanufactures	--	3	Mainly from United States.
Platinum and platinum-group metals, unworked or partly worked ... troy ounces	5,755	6,945	West Germany 4,694; Italy 2,250.
Silver:			
Ore and/or metallurgical residues containing silver	--	1	Mainly from Italy.
Metal, unworked or partly worked ... troy ounces	106,773	188,692	West Germany 67,034; Italy 66,745; France 54,720.
Tin including alloys, unwrought and semimanufactures ... long tons	19	13	United Kingdom 5; India 2; Netherlands 2; West Germany 2.
Zinc including alloys, unwrought and semimanufactures	484	380	Netherlands 100; Belgium 99; United Kingdom 67.
Other:			
Nonferrous ores, not further identified	--	1,300	All from Greece.
Nonferrous scrap, not further identified	5	1	All from United States.
Nonferrous metals, not further identified	--	2	Mainly from United Kingdom.

See footnotes at end of table.

Table 4.—Libya: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1968	1969	Principal sources, 1969
NONMETALS			
Abrasives:			
Crude, natural	11,000	25,139	Italy 25,134.
Grinding and polishing wheels and stones	173	102	Italy 62; Denmark 15; West Germany 6.
Asbestos, crude	59	442	All from Canada.
Cement, hydraulic thousand tons	721	598	Greece 275; Italy 77; Bulgaria 58; Poland 45.
Chalk	13	31	Tunisia 16; United Kingdom 8.
Clays and products:			
Crude thousand tons	55	15	Italy 6; Greece 6; United Kingdom 1.
Products:			
Refractory	251	1,388	United Kingdom 702; Italy 564.
Nonrefractory	153,300	149,484	Italy 71,423; Tunisia 70,629.
Fertilizer materials:			
Crude, all types	201	1,804	Greece 900; West Germany 800.
Manufactured:			
Nitrogenous	26,553	24,061	West Germany 8,261; Italy 7,491 Netherlands 6,348.
Phosphatic		15	All from Italy.
Mixed		2,111	West Germany 1,160; Italy 750.
Graphite	204	30	All from United States.
Gypsum and plasters	742	3,866	Ireland 3,000; Italy 503.
Lime	78,320	68,582	Italy 29,252; Lebanon 26,457; Poland 5,687.
Mica, worked	85	47	Yugoslavia 42; United States 5.
Pigments, mineral	916	3,023	Greece 1,900; United Kingdom 582; Italy 295.
Salt	46	205	Arab Republic of Egypt 200.
Stone, sand and gravel:			
Dimension stone, crude and worked	21,488	19,963	Italy 19,223.
Gravel and crushed stone	35,518	84,184	Yugoslavia 52,490; Italy 17,347; Spain 5,187.
Sand	211	181	Norway 150; Italy 30.
Sulfur, elemental	25	2,009	Turkey 1,950.
Talc and steatite	60	35	All from Italy.
Other:			
Crude nonmetals	2,080	2,118	Romania 1,045; United Kingdom 454; Italy 428.
Slag, dross and similar materials, not metal bearing	NA	10	All from United States.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt, natural	48,464	24,416	Italy 8,210; Venezuela 6,178; India 5,147.
Coal, coke and briquets	3,606	792	United Kingdom 467; United States 264.
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	1,592	1,306	Italy 779; Netherlands 405.
Kerosine and jet fuel do	195	95	Italy 54; Netherlands 41.
Distillate fuel oil do	11,952	1,860	Italy 1,614; Netherlands 246.
Residual fuel oil do	332	296	Italy 219; Netherlands 76.
Lubricants do	122	187	Italy 79; United States 78.
Liquefied petroleum gas [1] do	97	101	Italy 97.
Other do	625	770	Italy 360; United Kingdom 192; Venezuela 188.
Total do	[r] 14,915	4,615	
Crude chemicals from distillation of coal oil and gas	767	3,363	United Kingdom 2,655; Albania 703.

[r] Revised. NA Not available.

[1] Erroneously classified as natural and manufactured gas in previous edition.

COMMODITY REVIEW

METALS

There was no production of metals in Libya during 1971. Some iron and steel scrap was exported and modest imports covered the country's demand for metals.

Iron and Steel.—The Libyan Industrial Research Center signed a contract with a private Indian firm for a study on the economics of a steel complex in Libya. The firm is to study the possibility of using ores from a not-yet-developed iron ore deposit at Wadi Ash Shati and natural gas in a direct reduction process. The steel from the plant will first be used for Libya's needs and eventually quantities exceeding domestic needs will be exported. A Polish firm had a contract to determine the extent, grade, and economic aspects of the Wadi Ash Shati iron ore deposit. If the plant is built, imported iron ore will be used until development of the domestic iron ore deposits is completed. No results of the study have yet been made public.

Berliner Maschinenbau A.G. of West Germany and the Libyan Government signed a contract recently to construct a welded pipe mill with a capacity of 75,000 tons per year. Location of the plant was not made public and reports indicated the completion date would be late in 1975 or early in 1976.

NONMETALS

The modest production of nonmetals was only of domestic significance during 1970 as in the past years. The Government tried to develop an interest in production and processing of nonmetallics, but the results were limited.

Cement.—The West German company Vedag and Yugoslavia's Minel have concluded an agreement calling for Minel's participation in constructing the second phase of the cement plant at Benghazi. The plant capacity will be increased from the present 350 tons to 1,000 tons per day. The value of Yugoslavia's share in the program was reported at $2.5 million.[2]

Fertilizer Materials.—The construction of a 270,000-ton-per-year nitrogen petrochemical plant at Zuetina and preparation for construction of a second nitrogen plant near Benghazi continued. Details on progress of both projects were limited during 1971. In addition the Government retained a Polish firm to explore and evaluate known phosphate rock deposits in the south and southwest part of the country.

MINERAL FUELS

After strained negotiations between the operating companies and the Libyan Government, a new 5-year agreement was concluded. Accordingly, the posted price of Libyan crude oil (40 degree API) was set at $3.45 per barrel, a $0.90 increase, starting March 20, 1971, and tax was set at 55 percent of the posted price. In addition the price per barrel will increase in 1973, 1974, and 1975, by 2.5 percent plus $0.05. Furthermore, the companies agreed to pay taxes and royalties every month instead of every 3 months and to supply local marketing needs in crude oil at cost.

On March 5, 1971, Esso Standard Libya Inc. agreed to pay the increased price for natural gas. For every million of British Thermal Units (Btu) exported to Spain, Esso will pay $0.34 f.o.b. Brega terminal. The price for gas delivered to Italy f.o.b. Brezo was set at $0.345 cents per one million Btu, in mid-1971.

After the agreement was reached the company received permission to start export of LNG from its plant at Marsa el-Brega which was completed in 1970. The first shipments began under long term contract to both Spain and Italy. However, in August 1971, the shipments to Italy were suspended until the yearend, because of technical difficulties at the receiving plant in Italy.

Late in 1971 the 65 concessions of BP Libya were nationalized as a repraisal for Iranian occupation of three small Arab-owned islands in the Persian Gulf. The Libyans blamed the British for the Iranian action, maintaining collusion between the two nations. At yearend, negotiations and other legal steps were underway aiming on settling the nationalization issue.

Activities in the oil industry slowed down during the year. Crude oil production decreased 18 percent compared with that of 1970. Most companies were producing less than the allowables arbitrarily fixed by the Government in mid-1970. Current exploration was just above the one rig per company minimum required, and few operators showed much desire for developing new discoveries. Compagnie Française des Pétroles and Gulf left Libya in 1970 and Phillips Petroleum Co. gave up its only producing field to Libyan National Oil Corporation (Linoco) rather than agree to the new fiscal terms imposed. The tabulation below shows Libya's crude oil output by company in 1971, in thousand barrels per day:

American Overseas Petroleum, Ltd. (Amoseas)	261.2
British Petroleum Co. Ltd./Nelson Bunker Hunt	415.9
Esso Standard Libya, Inc	389.0
Mobil Oil Libya Ltd./Gelsenberg Benzin, A. G	186.4
Occidental of Libya, Inc	586.7
Oasis Oil Co. of Libya, Inc	827.0
Other	92.2
Total	2,758.4

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[2] Where necessary values have been converted from Libyan dinar (Ld) to U.S. dollars at the rate 1d=US$2.80.

Esso Libya's production averaged 389,000 barrels per day, or 37 percent less than in 1970. The lower level of production was a result of a natural decline in output from most of its fields and the continuation of some government limitation on production.

The Oasis Oil Co. of Libya, Inc. produced an average of 827,000 barrels of oil per day, remaining the largest crude oil producer in the country although production fell 8 percent during the year. As of September 1971, total crude oil reserves of the Oasis groups concessions in fields presently connected to the pipeline system were estimated at 283 billion barrels, or about one-tenth of the country's reserves. A natural gas processing plant started production near the Dahra oilfield in August 1971. The dry gas from the plant is reinjected into the Dahra producing formation for pressure maintenance. Pending approval of the Libyan Government, Oasis has completed arrangements for the sale of natural gas from the Waha and Defa fields to Esso Libya's LNG plant at Marsa el-Brega. A pipeline will connect fields with the Esso facilities. Pipeline deliveries of gas from the fields should start in 1973. During 1971 Oasis completed six unsuccessful exploratory wells. Five development wells were drilled, of which four were oil producers and one was dry.

Occidental of Libya, Inc. produced about 586,700 barrels per day of crude oil during 1971, a decrease of about 21 percent compared with 1970 output. The principal reason for the decrease reflects the declining competitive position of Libyan crudes particularly in northern West European markets. This is due primarily to the drastically reduced tanker rates, which eliminated the price advantage that Mediterranean crudes had over the long haul crudes from the Middle East.

Occidental's liquefied petroleum gas (LPG) plant was near completion at yearend 1971. Company officials expect to start shipping butane and naphtha during January 1972 and propane during the following May. Plant capacity is reported to be 68,000 barrels per day of liquid products. Occidental has also concluded an agreement with Agip S.P.A., a subsidiary of Ente Nazionale Idrocarburi (ENI), the Italian Government-owned oil company, to transport and ship Agip's oil production through Occidental pipeline and terminal facilities. In addition Occidental will inject and store Agip's gas in its Intisar field. Agip's initial production of 100,000 barrels per day will be ultimately increased to 300,000 barrels per day. The Government of Libya has approved the agreement.

American Overseas Petroleum, Ltd. (Amoseas) crude oil production averaged approximately 262,200 barrels of oil per day, or about .08 percent more than in 1970. Drilling activities led to a discovery well at Baalawn. The well tested at about 6,000 barrels of oil per day.

Linoco remained the Libyan Government's instrument for petroleum development. During 1971 the company received $60 million from the country's development budget. These funds are to be used for the following activities. Reorganization and modernization of three product distribution companies nationalized in 1970; production of the Umm Farud oilfield, relinquished in 1970 by Phillips; a geophysical survey contract; recruiting foreign technical and managerial personnel; training abroad of 150 Libyan technicians and process operators; preparing the construction of a 60,000-barrel-per-day petroleum refinery near Tripoli; preparing a $16 million, 50-50 joint venture in a 1,000-ton-per-day methanol plant with Occidental for developing acreage relinquished by large companies. The intent of the Libyan Government is to make Linoco an important factor in the country's petroleum industry and the economy.

The Mineral Industry of Malaysia

By John W. Cole [1]

Despite falling international prices for most of Malaysia's basic commodity exports (rubber, tin, and timber) in 1971, the economy continued to expand, although at a lower rate than anticipated under the Second Malaysia Plan. Gross national product (GNP) grew by 4.8 percent. Although total export value decreased slightly, the merchandise balance of trade continued to be favorable. The balance of payments resulted in a larger surplus than that of 1970.

The Second Malaysia Plan 1971–75 predicts a 4.3-percent annual decline in smelter tin production during the next 5 years, from 91,000 tons in 1970 to 73,000 tons in 1975, principally because of a decrease in imports of tin concentrate from Indonesia. The plan estimates tin revenue for 1975 at $281 million compared with 1970 income of $362 million.[2] The contribution of the mining sector to the GNP in West Malaysia is expected to decline 13 percent to M$484 million by 1975 from M$556 million in 1970.

Indonesia, Malaysia, and Thailand signed an agreement late in 1971 delimiting their respective continental shelves, thereby clearing the way for offshore minerals exploration in the northern Malacca Straits.

A team of six economists and engineers from the United Nations Industrial Development Organization (UNIDO) and Malaysia's Federal Industrial Development Authority (FIDA) studied the problems faced by industry in Sarawak. The teams report and recommendations were to be submitted early in 1972.

PRODUCTION

Of the major export mineral products, output of iron ore and bauxite decreased and output of mine tin and petroleum increased. Output of tin-in-concentrates increased 2 percent to 74,253 long tons with a value of $281 million.

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[1] Physical scientist (retired), Division of Nonferrous Metals.

[2] Where necessary, values have been converted from Malaysian dollars (M$) to U.S. dollars at the rate of M$2.80=US$1.00.

Table 1.—Malaysia: Production of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity [2]	1969	1970	1971 [p]
METALS			
Aluminum, bauxite, gross weight .... thousand tons..	1,073	1,139	978
Antimony mine output, metal content (Sarawak)	[r] 86	180	289
Columbium and tantalum concentrates, gross weight	64	61	24
Copper mine output, metal content [e] [3]	[r] 254	305	214
Gold mine output, metal content:			
West Malaysia .... troy ounces..	3,153	3,912	NA
Sarawak .... do....	2,271	1,265	NA
Total .... do....	5,424	5,177	5,671
Iron and steel:			
Iron ore and concentrates .... thousand tons..	5,234	4,491	950
Pig iron and blast furnace ferroalloys [e] .... do....	60	60	60
Crude steel [e] .... do....	60	60	70
Manganese ore and concentrate, gross weight [4]	10,334	--	26,798
Rare-earth minerals:			
Monazite, gross weight [4]	2,054	1,657	1,471
Xenotime (yttrium mineral) gross weight [5]	153	353	101
Tin:			
Mine output, metal content .... long tons..	72,167	72,630	74,253
Smelter output .... do....	87,089	88,886	85,719
Titanium, ilmenite concentrate, gross weight [5]	132,628	192,455	155,983
Tungsten mine output, metal content	138	136	113
Zirconium, zircon concentrate, gross weight [5]	[r] 1,415	860	2,543
NONMETALS			
Cement, hydraulic .... thousand tons..	973	1,030	1,096
Clays, kaolin	2,048	3,327	11,655
MINERAL FUELS AND RELATED MATERIALS			
Petroleum:			
Crude (Sarawak) .... thousand 42-gallon barrels..	3,278	6,599	25,071
Refinery products (Sarawak and West Malaysia):			
Gasoline .... do....	5,950	[e] 3,984	2,731
Jet fuel .... do....	5,475	[e] 7,290	8,138
Kerosine .... do....	3,285	[e] 2,423	1,032
Distillate fuel oil .... do....	6,096	[e] 6,746	6,198
Residual fuel oil .... do....	20,002	[e] 17,186	7,267
Other .... do....	1,096	[e] 2,062	15,115
Refinery fuel and losses .... do....	2,117	[e] 2,427	1,682
Total .... do....	44,021	[e] 42,118	42,163

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] All recorded production is from West Malaysia unless otherwise indicated parenthetically in commodity column.

[2] In addition to the commodities listed, a variety of crude construction materials such as clays, sand and gravel, and stone, are also produced, but output is unreported and available information is inadequate to make reliable estimates of output levels.

[3] Estimates based on exports of copper concentrates.

[4] Ferruginous manganese ore or manganiferous iron ore.

[5] Exports.

TRADE

Malaysian smelter-tin exports amounted to 85,170 long tons in 1971, 5,333 tons less than in 1970, principally because of a decrease in imports of tin concentrate. The value of tin exports in 1970 was 20 percent of total exports, second only to rubber (33 percent of total exports). The value of iron ore exports amounted to only 2 percent of the total. The other 45 percent of the value of exports included timber (16 percent), palm oil (4 percent), and other (25 percent). Included in the "other" category of exports are petroleum and petroleum products which increased 94 percent, from $72 million in 1970 to $140 million in 1971.

Japan is Sabah's main trading partner after West Malaysia. During 1970 Japan purchased over 50 percent of Sabah's total foreign exports, or $95 million worth of goods, up $2.3 million from 1969. The majority of the purchases consisted of timber, but palm oil, fish, and rubber were also included. In 1970 Sabah imported $25.7 million worth of goods from Japan, up $4.7 million from 1969 imports, about one-fifth of Sabah's total imports from foreign countries. Imports from Japan consisted mainly of industrial and other machinery, electrical machinery, electrical apparatus and appliances, and motor vehicles.

In 1970, Sarawak exported to Japan $38.7 million worth of goods, up $1.2 million from the previous year. Exports to Japan consisted mainly of timber; other exports to Japan included rubber and crude petroleum. Sarawak imported $15.6 million worth of goods from Japan, up $4.7 million from 1969. Japan supplied over one-third of the imports from foreign areas (except Singapore and Brunei).

Table 2.—Malaysia:[1] Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum:		
Bauxite	876,854	1,083,217
Metal including alloys:		
Unwrought	34	60
Semimanufactures	203	173
Copper:		
Ore	1,016	1,221
Metal:		
Scrap	2,602	1,228
Unwrought and semimanufactures	300	565
Iron and steel:		
Iron ore thousand tons	5,347	4,901
Metal:		
Iron and steel scrap	28,017	19,729
Pig iron, ferroalloys and similar materials	1,198	9
Steel, primary forms	221	101
Semimanufactures:		
Bars, rods, angles, shapes, and sections	12,190	2,281
Universals, plates and sheets	5,544	5,632
Hoop and strip	41	44
Rails and accessories	2,073	3,971
Wire	101	229
Tubes, pipes, and fittings	11,813	12,433
Castings and forgings, rough	74	266
Lead:		
Ore	361	306
Oxides	53	(2)
Metal including alloys, all forms	688	458
Magnesium metal including alloys, all forms	11	1
Manganese ore	45,670	--
Mercury 76-pound flasks	3	(2)
Monazite	1,605	1,657
Thorium ore	164	393
Tin:		
Ore long tons	753	696
Metal including alloys:		
Unwrought do	89,830	90,501
Semimanufactures do	6	39
Titanium ore and concentrate	134,091	223,495
Tungsten ore and concentrate	229	172
Zinc metal including alloys:		
Scrap	422	313
Blue powder	3	--
Unwrought	6	12
Semimanufactures	93	244
Other:		
Ash and residue containing nonferrous metals	433	645
Oxides, hydroxides and peroxides of metals n.e.s	7	15
Metals including alloys, all forms:		
Alkali, alkaline earth and rare-earth metals	122	5
NONMETALS		
Abrasives, natural n.e.s.:		
Pumice, emery, natural corundum, etc	10	77
Asbestos	33	7
Barite and witherite	15	2,246
Boron materials, crude	6	(2)
Cement	314,358	354,166
Clays and products (including refractory brick):		
Crude:		
China (kaolin)	578	962
Fuller's earth	56	31
Other	246	1,369
Products:		
Refractory	70	19
Nonrefractory	1,900	2,183
Diamond, gem not set or strung value	$153,913	$516,507
Diatomite and other infusorial earths	29	13
Fertilizer materials:		
Crude, phosphatic	1,154	1,226

See footnotes at end of table.

Table 2.—Malaysia:[1] Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970
NONMETALS—Continued		
Fertilizer materials—Continued		
Manufactured:		
Nitrogenous	52	19
Phosphatic	39	2
Potassic	82	16
Other including mixed	14,213	7,679
Ammonia	369	279
Gypsum and plasters	72	68
Lime	5,832	7,898
Pigments, mineral, natural, crude	17	9
Precious and semiprecious stones, except diamond, natural ... value	$40,400	$80,356
Salt and brine	3,765	1,748
Sodium and potassium compounds n.e.s.:		
Caustic soda	203	206
Caustic potash, sodic and potassic peroxides	3	(2)
Stone, sand and gravel:		
Dimension stone:		
Crude and partly worked	9,279	14,262
Worked	284	285
Dolomite, chiefly refractory grade	1,264	1,157
Gravel and crushed rock	179,263	171,439
Limestone (except dimension)	5,861	11,069
Quartz and quartzite	34	187
Sand, excluding metal bearing	11,940	7,559
Talc, steatite, soapstone, and pyrophyllite	206	72
Other nonmetals n.e.s.:		
Crude	202	261
Slag, dross and similar waste, not metal bearing	519	25
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals n.e.s	10,974	18,294
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	493	278
Carbon black and gas carbon	24	3
Coke and semicoke	139	384
Petroleum:		
Crude ... thousand 42-gallon barrels	23,464	28,077
Partly refined ... do	7,682	8,126
Refinery products:		
Aviation gasoline ... do	5	3
Motor gasoline ... do	713	6,553
Kerosine ... do	682	1,910
Jet fuel ... do	5,710	565
Distillate fuel oil ... do	1,882	2,155
Residual fuel oil ... do	9,996	8,839
Lubricants ... do	3	49
Other, bitumen and other residues ... do	25	69
Total ... do	19,016	20,143

[1] Table includes West Malaysia, Sarawak, and Sabah. Previous publication of exports of mineral commodities was solely for West Malaysia.

[2] Less than ½ unit.

Table 3.—Malaysia:[1] Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum:		
Oxide and hydroxide	2,712	3,281
Metal and alloys, all forms	4,964	11,797
Chrome, oxide and hydroxides	44	65
Cobalt, oxide and hydroxides	1	3
Copper:		
Ore and concentrate	56	264
Metal and alloys, all forms	2,866	4,137
Iron and steel:		
Iron and steel scrap	4,048	3,422
Pig iron including cast iron	12	23
Sponge iron, powder and shot	97	254
Ferroalloys:		
Ferromanganese	509	579
Other	303	950
Steel, primary forms	575	879

See footnote at end of table.

Table 3.—Malaysia: [1] Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS—Continued		
Iron and steel—Continued		
Semimanufactures:		
Bars, rods, angles, shapes, and sections	50,363	79,994
Universals, plates and sheets	154,075	198,004
Hoop and strip	21,103	33,349
Rails and accessories	2,197	4,274
Wire	32,755	30,064
Tubes, pipes, and fittings	29,215	35,184
Castings and forgings, rough	2,298	2,957
Lead:		
Ore and concentrate	48	2
Oxides	728	756
Metal including alloys, all forms	1,420	2,642
Magnesium metal including alloys, unwrought	69	46
Manganese:		
Ore and concentrates	2,288	1,629
Oxides	339	307
Mercury 76-pound flasks	64	66
Molybdenum metal including alloys, all forms	28	53
Nickel metal including alloys, unwrought and semimanufactures	36	63
Platinum-group metals including alloys troy ounces	1,327	16,530
Silver do	4,556	3,919
Tin:		
Ore long tons	18,387	20,833
Metal including alloys, all forms do	660	522
Titanium oxides	1,601	1,862
Zinc:		
Ore	2,105	2,673
Oxide	1,234	794
Metal including alloys, all forms	4,191	4,928
Other:		
Ash and residue containing nonferrous metals	1,028	1,541
Metals including alloys, all forms:		
Metalloids	149	360
Alkali, alkaline earth and rare-earth metals	27	73
Pyrophoric alloys	27	22
NONMETALS		
Abrasives, natural n.e.s.: Pumice, emery, corundum, etc	109	299
Asbestos	8,794	14,371
Barite and witherite	108	7,608
Boron materials:		
Crude natural borates	99	180
Oxide and acid	67	97
Cement	32,316	27,102
Chalk	337	265
Clays and products:		
Crude:		
Bentonite	120	251
China (kaolin)	1,488	1,577
Fuller's earth	1,708	1,507
Mullite, charmotte, and dinas earths	123	180
Other	1,238	4,260
Products:		
Refractory	9,618	18,358
Nonrefractory	9,754	10,564
Diamond, gem not set or strung value, thousands	$1,497	$2,035
Diatomite and other infusorial earths	319	167
Feldspar	3,951	5,828
Fertilizer materials:		
Crude:		
Nitrogenous	66	117
Phosphatic	84,152	92,993
Potassic	490	578
Other	27,239	34,574
Manufactured:		
Nitrogenous	76,097	91,855
Phosphatic:		
Thomas (basic) slag	388	25
Other	7,177	8,690
Potassic	77,290	105,262
Other including mixed	56,388	56,300
Ammonia	8,266	12,960
Graphite, natural	106	126
Gypsum and plasters	30,670	40,987
Lime	2,190	1,414
Magnesite	333	243
Pigments, mineral:		
Natural, crude	245	163
Iron oxides	772	714

See footnote at end of table.

Table 3.—Malaysia:[1] Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970
NONMETALS—Continued		
Precious and semiprecious stones, except diamond:		
Natural ... value	$44,516	$224,088
Manufactured ... do	$3,730	$2,342
Pyrite	32	47
Salt and brine	122,743	95,504
Sodium and potassium compounds n.e.s.:		
Caustic soda	3,962	5,486
Caustic potash, sodic and potassic peroxides	636	684
Stone, sand and gravel:		
Dimension stone, crude and worked	1,733	2,149
Dolomite, chiefly refractory grade	98	283
Gravel and crushed rock	3,671	2,206
Limestone (except dimension)	1,934	1,711
Quartz and quartzite	44	501
Sand excluding metal	3,081	4,307
Sulfur:		
Elemental, all forms	5,620	10,824
Sulfur dioxide	345	4
Sulfuric acid	625	385
Other nonmetals, n.e.s	3,597	3,749
Crude	23,913	25,810
Slag, dross and similar waste, not metal bearing	110	41
Oxides and hydroxides of magnesium, strontium, and barium	19	14
Building materials of asphalt, asbestos, and fiber cement and unfired metals n.e.s	12,295	14,441
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	1,610	3,577
Carbon black	4,357	4,266
Coal, coke, and briquets:		
Anthracite and bituminous coal	17,009	12,414
Lignite and lignite briquets	100	51
Coke and semicoke	6,608	12,076
Petroleum:		
Crude ... thousand 42-gallon barrels	69,527	70,316
Partly refined ... do	325	355
Refinery products:		
Aviation gasoline ... do	22	82
Motor gasoline ... do	1,095	1,291
Kerosine ... do	660	575
Jet fuel ... do	285	484
Distillate fuel oil ... do	3,842	5,478
Residual fuel oil ... do	280	375
Lubricants ... do	180	1,124
Mineral jelly and wax ... do	41	30
Other:		
Nonlubricating oils ... do	51	103
Petroleum coke ... do	4	18
Bitumen and other residues ... do	96	98
Total ... do	6,556	9,658

[1] Table includes West Malaysia, Sarawak, and Sabah. Previous publication of imports of mineral commodities was solely for West Malaysia.

COMMODITY REVIEW

METALS

Aluminum and Bauxite.—Contrary to expectations, output of bauxite declined 15 percent from that of 1970. The opening of a third mine in 1970 and a fourth in 1971 had been expected to result in a substantial increase in production. The mine which opened in 1970, a small operation situated at Johore Kimm Kimm, employs a work force of about 60 and has a production capacity of about 4,000 tons per month.

The mine which opened in 1971 is operated by Ramunia Bauxite. It is expected to employ 200 to 300 workers on two shifts. The company, in operation since 1952, is Malaysia's second largest producer of bauxite, with an output of 370,000 tons in 1970, all of which was shipped to Japan.

South East Bauxite, established about 30 years ago as a subsidiary of Alcan Aluminum Ltd. of Canada, produced about 730,000 tons in 1970 for buyers in Japan and Canada.

Copper.—Full production at the Mamut copper mine in Sabah is expected in 1973 instead of 1972, as previously reported. The Mamut mine is owned by Overseas Mineral Resources Development Co., Ltd., which is owned by a consortium of eight Japanese smelting companies (51 percent) and Malaysian shareholders (49 percent). Ore reserves are estimated to be 122 million tons containing 0.6 to 0.8 percent copper.

Iron Ore.—Two large iron mines in Malaysia were shut down in 1970, one in October and the other in December, because of depletion of ore reserves. The two mines, Rompin in Pahang and Dungun in Trengganu, accounted for 83 percent of Malaysia's total output of 4.5 million tons in 1970. All exports of iron ore during 1970, valued at $34.9 million were bought by Japan.

Iron and Steel.—Malayawata Steel Berhad, Malaysia's only steel producer, announced plans for installation of an electrolytic tin plate line for the production of hoops and cold formed light gage sections, in collaboration with United States Steel Corp. The capacity of the Malayawata plant is 120,000 tons per year made from a pig iron reduced from local ores with charcoal made from rubber trees.

India's Mukand Iron and Steel is participating with Malaysian private sector interests in setting up an alloy steel foundry in Kuala Lumpur with an initial capacity of 2,160 tons per year of steel castings. A joint company, Jaya Jeewan Sendiran Berhad, has announced plans for construction in 1972, with first production expected in 1973.

Tin.—The Malaysian tin industry, the world's largest, had another good year in 1971. Production of tin in concentrates was second only to 1968 in post-World War II output. Prices rose steadily throughout the year on the London Metal Market, from about £1,440 to almost £1,500 per metric ton. At yearend 1970, 1,084 mines were in operation, of which 61 operations employed dredges, 979 were gravel-pump operations, and 44 used other extraction methods. About 32 percent of Malaysian tin is extracted by dredging, 55 percent by gravel pumping, and 13 percent by other mining methods.

The Selangor Dredging Company signed a contract with F. W. Payne and Sons to build a second dredge for its property in the State of Selangor. The dredge will be one of the largest in Malaysia; it will be capable of digging 864,000 cubic yards per month to a maximum depth of 150 feet. It will have an overall length of 700 feet; the pontoon will be 328 feet by 96 feet and have a dry weight displacement of 5,500 tons. The 24-cubic-foot buckets will turn over 36 buckets per minute. The treatment plant will be equipped with IHC-Cleaveland Circular Jigs. The estimated cost of the dredge is $3.8 million.

Pacific Tin Consolidated Corporation, the only U.S.—based company mining tin in Malaysia, operated three bucketline dredges in 1971. The year's results from dredging and gravel-pump operations are summarized as follows:

	1970	1971
Cubic yards (dredges and gravel-pumps)	11,175,500	9,288,000
Pounds of tin recovered	2,363,572	2,397,194

Source: Pacific Tin Consolidated Corp., 1971 Annual Report.

Tin ore reserves on company land in Malaysia as of December 31, 1971, were as follows:

	Estimated cubic yards	Pounds of tin	Pounds of tin per cubic yard
Dredging ground	80,993,000	18,339,000	0.23
Gravel pump ground	12,152,000	3,025,000	.25
Total	93,145,000	21,364,000	.23

Source: Pacific Tin Consolidated Corp., 1971 Annual Report.

MINERAL FUELS

Natural Gas.—Sarawak Shell is planning to build a liquefied natural gas (LNG) plant that will cost about $1,000 million, or about twice as much as Brunei's LNG plant which is reportedly the largest in the world. The gas deposits are 80 to 120 miles offshore from Bintulu in Sarawak's fourth division. Capacity of the LNG plant would be 6 to 7 million tons per year.

Petroleum.—The State of Sarawak is Malaysia's only oil producing area. Sarawak Shell Berhad holds the producing concession. Early in 1971, the company announced that its oil production would increase from 50,000 barrels per day to 70,000 barrels per day later in the year. Of the 50,000 barrels per day, only 600 barrels per day comes from land wells; the remainder comes from offshore wells that started to produce in 1968.

A Japanese oil company, Sabah Teiseki Oil Co. Ltd., a subsidiary of Teikoku Oil Company of Japan, has agreed to spend several million dollars prospecting its 7,500-

square-mile concession off the east coast of Sabah. Three holes drilled by Sabah Teiseki, Sibuko Bay 1, 2, and 3, in this concession in 1970 were dry and abandoned.

Esso Exploration has active programs on a 28,700-square-mile concession off the east coast of West Malaysia and on concessions totaling 6,100 square miles offshore Sabah. Two drilling rigs were active at yearend 1971.

Although complete statistics on exploratory drilling in 1970 are not available, four companies reported 14 wells completed during the year and two more in progress.

Sarawak Shell Oilfields, Ltd., used from one to three rigs during 1970 and is believed to have completed more than 20 wells.

Shell Refining Company Berhad announced plans for construction in 1972 of a second oil refinery complex on Malaysia's west coast, at Port Dickson, to cost an estimated $27 million.

Exploratory wells in Malaysia, 1970 [1]

Company	Well	Location		Completion date (month and day)	Total depth (feet)	Remarks
		North latitude	East longitude			
Aquitaine Petroleum Co. (SE Asia).	Gem Reef–1	5°34′07″	119°08′02″	9/1	11,119	Drilled and abandoned.
	Benrinnes–1	5°50′47″	118°44′30″	11/3	9,967	Do.
	Magpie W–1	5°47′40″	118°59′25″	12/2	5,101	Do.
Conoco of Malaysia	Duyong–1	4°59′03″	105°13′37″	10/15	9,942	Do.
	Penyu–1	3°51′44″	104°12′53″	7/6	8,821	Do.
Esso Exploration Malaysia Inc.	Bintang–1	6°34′20″	103°15′30″	1/11	980	Do.
	Bintang–2	6°33′14″	103°14′49″	3/19	6,610	Do.
	Bintang–3	6°30′50″	103°13′23″	4/21	6,224	Do.
	Sepat–1	6°21′58″	103°50′39″	5/23	5,955	Do.
	Bujang–1	5°59′59″	104°01′46″	7/24	5,675	Do.
	Belumut–1	5°31′40″	105°38′18″	12/14	4,675	Do.
	Belumut–2	5°30′56″	105°39′46″	NA	5,038	Logging at total depth on 12/31.
	Tok-Bidan–1	6°25′34″	102°39′27″	NA	NA	Drilling at 7,790 feet on 12/31.
Sabah Teiseki Oil Co. Ltd.	Sibuko Bay–1	4°12′08″	118°42′42″	7/30	NA	Drilled and abandoned.
	Sibuko Bay–2	4°10′43″	118°07′31″	10/5	NA	Do.
	Sibuko Bay–3	4°13′53″	118°06′20″	NA	NA	Do.

NA Not available.

[1] Complete except for Sarawak Shell Ltd. wells.

Source: The American Association of Petroleum Geologists Bulletin, September 1971.

The Mineral Industry of Mexico

By Burton E. Ashley [1]

The mining industry in Mexico during 1971 was slack compared with the previous year. Part of the slowdown was attributed to the change in the Presidential Administration and part to the general world economic situation. While preliminary figures indicate a growth in the gross national product, the share which mining contributed declined from 1.86 percent in 1970 to 1.52 percent in 1971.[2] The labor force in mining numbered an estimated 111,000 persons, a gain from 3.10 percent of the total labor force in 1970 to 3.14 percent in 1971.

Foreign trade in minerals by value, as a measure of total foreign trade, declined in respect to imports but exports increased.

In terms of value of total mineral exports, metallic minerals contributed 61 percent and nonmetallic minerals 39 percent. These figures show a lower percentage of metallic mineral exports and a higher percentage of nonmetallic mineral exports in comparison to 1970.

As for 1971 mineral imports, 47 percent was attributed to metallic minerals and 53 percent to nonmetallics. Comparative figures for 1970 for metallic and nonmetallic mineral imports were 61 percent and 39 percent, respectively.

Mexican steel output, which may be a measure of a country's economic strength, declined by about 2 percent compared with 1970 output, the first such drop since World War II. Production of pig iron and sponge iron registered gains of 2 percent and 10 percent, respectively.

Because of the unfavorable economic conditions in Mexico during much of 1971, industrial activities which traditionally use steel were reduced which resulted in a decline of nearly 5 percent in apparent consumption. Apparent consumption in 1970 was slightly more than 4 million tons compared with 3.8 million tons in 1971.

The interruption in steel production and consumption was not expected to persist. It was estimated that in 1975 consumption would be on the order of 5 million tons per year, with production capacity at 8 million tons; consumption in 1980 was expected to increase to 10 million tons, with a productive target of more than 12 million tons.

Mexican expertise in steel making advanced to the point where technology was exported to various countries in Latin America. Cooperation was given in a number of phases of the industry including installation of an integrated steel mill, sponge iron plant, and a galvanizing line.

In line with Mexico's future increase in iron and steel output, the Secretary of the Treasury formed an organization to include all iron and steel firms which might be interested in increased exports; it was also intended to encourage cooperation between the private and governmentally controlled companies in the industry.

Mexican Government policy to encourage the mining industry was illustrated in a number of ways. Because of depressed world silver prices, and as an aid to small and medium silver miners in particular, silver was exempted from the production and export tax.

In conformity with Mexico's policy of encouraging mineral exports of the highest possible grade, plans were announced by a number of companies to increase, and start, domestic production of hydrofluoric acid. Most of the acid would be for export to the United States as well as to other countries. Mexico should benefit considerably in foreign exchange gains, as hydrofluoric acid was priced about 7 times higher than fluorite; in addition, Mexico does not tax exports of hydrofluoric acid and such imports enter the United States free of duty. Fluorite from Mexico is liable for export tax, and U.S. imports are dutiable.

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[1] Physical scientist, Division of Nonferrous Metals.

[2] Anuario Estadístico de la Mineria Mexicana 1971. Consejo de Recursos Naturales No Renovables. Mexico, D.F., 1972, p. 23.

At yearend 1971 the President signed a bill to create the National Institute of Nuclear Energy (NINE). The Institute was to replace the National Commission of Nuclear Energy (CNEN) which had functioned since January 1, 1956. NINE would utilize the trained personnel from the old Commission, its research programs, laboratories and all facilities which had been built. The new policy of the Institute was "for the development of nuclear science and technology, oriented principally towards the processing of nuclear fuels for use in reactors for electrical power generation."

The draft legislation that created NINE charges the Institute with the control of imports of radioactive material and nuclear fuel and of exports of such fuel as may be made.

The Governing Board, the Director General, Deputy Director, and key departmental chiefs were to be appointed by the Presidency. The Governing Board was to be made up of the Secretaries of selected departments as well as the Directors General of some of the independant entities of the Government.

A bibliography was published by CNEN[3] listing its publications for the period October 1968 to September 1970. Entries were listed by consecutive numbers, by author, and by subject matter. The volume may be obtained from Biblioteca de Consulta, Comisión Nacional de Energía Nuclear, Insurgentes Sur 1188, 5th Piso, Mexico 18, D.F.

The National Council of Science and Technology (CONACYT) became the successor to the National Institute of Scientific Research. CONACYT's commitment was to be the instrument of national science policy. Its general aim was to reduce the need for the import of technology into Mexico, thereby avoiding the need for foreign technical assistance and royalty payments for imported technology. Part of the program was to coordinate scientific and technical efforts and promote cooperation among the national institutions working in the field.

In order to increase the numbers of technically qualified people in Mexico exchange agreements were completed with various countries. Mexican trainees were in Japan studying ore dressing and metallurgy, industrial ceramics, cement, and oceanography. Besides the 90 or so trainees in Japan, negotiations for exchange programs were in progress with about 20 other countries.

On the question of national problems, one of CONACYT's assigned priorities was the development of arid zones, including natural resource prospecting.

If CONACYT's program can be carried out successfully, Mexico should realize its long-range policy of achieving independence from foreign technology.

PRODUCTION

Of 18 selected metallic minerals produced in 1971 declines were registered in 10, in terms of volume, compared with 1970 output. The only high-volume metallic mineral gainers were iron ore, 8 percent, and copper, 4 percent. Higher gains were recorded in the metallic minerals produced in lower volume such as, tungsten, 42 percent; arsenic, 26 percent; and mercury, 17 percent.

A volume loss of 24 percent was sustained in gold and 14 percent in silver production. Lead output declined 11 percent and zinc was about even but slightly below the production level of 1970.

Of 20 nonmetallic minerals (excluding coal), 13 registered production gains, on a volume basis, compared with 1970 output. Fluorite output at 1.2 million tons gained 21 percent over the previous years' production. Production of siliceous materials and phosphorite rose 11 percent and 25 percent, respectively. Sulfur output was down by 17 percent.

Production of coal "ore" (which requires washing to obtain a 65-to 80-percent usable product) at 3.6 million tons was 20 percent higher than production in 1970.

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[3] Comisión Nacional de Energía Nuclear (National Commission on Nuclear Energy). Indice de Publicaciones (301–350), No. 370, BIB-5, April 1971, 31 pp.

All of this coal was from the State of Coahuila.

Table 2 lists the States which produced the greatest percent, by volume, of selected mineral commodities in 1971.

Table 1.—Mexico: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1969	1970	1971 [p]
METALS			
Aluminum, primary	32,383	33,955	39,931
Antimony:			
Mine output, metal content	3,225	4,468	3,361
Metal (in mixed bars)	1,028	818	2,306
Arsenic, white [2]	7,983	9,133	11,483
Bismuth, content of exported concentrates, bullion and refined metal	606	571	570
Cadmium:			
Mine output, metal content	1,579	1,967	1,662
Metal, refined	210	268	192
Copper:			
Mine output, metal content	66,167	61,012	63,150
Electrolytic solution [3]	[r] 80	92	98
Precipitate, metal content [3]	[r] 75	38	--
Metal:			
Blister	64,877	59,609	61,936
Refined	56,589	53,676	52,577
Gold:			
Mine output, metal content ... troy ounces	180,599	198,241	150,915
Metal, refined ... do	169,163	191,457	147,089
Iron and steel:			
Iron ore:			
Gross weight [4] ... thousand tons	3,495	4,354	4,698
Metal content ... do	2,097	2,612	2,819
Pig iron and sponge iron ... do	[r] 2,098	2,261	2,357
Ferroalloys ... do	[r] 58	75	[e] 75
Crude steel ... do	3,470	3,881	3,809
Steel semimanufactures ... do	[r] 2,844	2,879	2,958
Lead:			
Mine output, metal content	170,894	176,597	156,852
Smelter (in refined mixed bars)	162,687	171,007	151,471
Manganese ore:			
Gross weight [5]	143,564	273,914	266,892
Metal content	60,136	98,609	96,081
Mercury, mine output, metal content ... 76-pound flasks	22,500	30,256	35,390
Molybdenum, mine output, metal content	202	141	79
Nickel, mine output, metal content	35	44	[e] 50
Selenium:			
Mine output, metal content	198	126	52
Refined	30	[e] 19	NA
Silver:			
Mine output, metal content ... thousand troy ounces	42,904	42,836	36,657
Metallurgical products, metal content ... do	41,699	41,493	35,349
Tin:			
Mine output, metal content ... long tons	490	525	471
Smelter, primary ... do	139	525	471
Tungsten, mine output, metal content	289	288	408
Zinc:			
Mine output, metal content	253,375	266,400	264,972
Smelter, primary	80,265	80,662	77,862
NONMETALS			
Asbestos	1	126	[e] 130
Barite	176,921	319,092	279,742
Cement, hydraulic ... thousand tons	6,787	7,267	7,360
Clays:			
Bentonite	46,017	65,012	57,628
Fuller's earth	21,401	24,197	[e] 24,000
Kaolin	89,732	78,548	72,587
Refractory	101,740	106,704	189,888
Diatomite	11,175	22,795	21,802
Feldspar	83,493	85,745	99,342
Fertilizer materials:			
Crude, phosphate rock	32,574	46,726	58,286
Manufactured:			
Nitrogenous, gross weight ... thousand tons	1,149	1,177	NA
Phosphatic, gross weight ... do	389	368	402
Mixed, gross weight ... do	271	279	NA
Fluorspar, all grades	988,304	978,485	1,180,955
Graphite, all grades	42,920	55,648	50,916
Gypsum and anhydrite, crude ... thousand tons	1,219	1,291	1,298
Magnesite	222	6,926	13,018
Mica, all grades	594	560	708

See footnotes at end of table.

Table 1.—Mexico: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity [1]	1969	1970	1971 [p]
NONMETALS—Continued			
Perlite	10,130	12,307	11,146
Salt, all types thousand tons	[r] 3,890	4,153	4,360
Stone, sand and gravel:			
Calcite, common	4,341	4,678	7,707
Dolomite	475,029	474,468	453,362
Limestone [6] thousand tons	1,938	2,361	3,001
Marble	12,036	12,187	8,362
Quartz, quartzite and glass sand	281,881	355,862	393,350
Cobblestone	NA	5,197	4,331
Strontium minerals	18,077	25,409	35,063
Sulfur, elemental:			
Frasch process thousand tons	1,631	1,296	1,091
Other native mined do	27	24	23
Byproduct from natural gas do	58	60	65
Sulfates, natural sodium	111,838	130,574	132,615
Talc and related materials, talc	1,333	2,105	1,714
Wollastonite	4,567	7,012	3,224
MINERAL FUELS AND RELATED MATERIALS			
Coal, bituminous thousand tons	2,458	2,959	3,353
Coke:			
Metallurgical do	1,141	1,300	1,589
Breeze do	93	NA	NA
Gas:			
Manufactured, all types million cubic feet	6,457	NA	NA
Natural:			
Gross production do	609,056	665,026	633,416
Marketable production do	417,085	481,106	478,552
Petroleum:			
Crude thousand 42-gallon barrels	149,661	156,530	155,912
Refinery products:			
Aviation gasoline do	551	493	520
Other gasoline do	46,078	51,183	52,100
Jet fuel do	2,681	3,086	3,265
Kerosine do	11,575	11,348	11,556
Distillate fuel oil do	27,581	30,403	30,195
Residual fuel oil do	43,135	47,640	45,951
Lubricants do	1,423	1,977	1,995
Other do	23,829	25,440	26,550
Refinery fuel and losses do	12,072	11,668	11,635
Total do	168,925	183,238	183,767

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, carbon black, lime, and a variety of crude construction materials are also produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels.

[2] Calculated white arsenic equivalent of metallic arsenic content of products reported.

[3] For export.

[4] Calculated on the basis of ore containing 60 percent iron, from reported metal content of mine production.

[5] Estimate calculated from reported metal content of mine production.

[6] Excluding that for cement production.

Table 2.—Percentage of total national production by State

(By volume)

Commodity	State	Percent of total national output
Metallic minerals:		
Gold	Durango	27
Silver	Chihuahua	28
Lead	do	63
Copper	Sonora	54
Zinc	Chihuahua	54
Iron ore	do	46
Manganese	Hidalgo	91
Nonmetallic minerals:		
Sulfur	Vera Cruz	97
Fluorite	San Luis Potosí	31
Do	Coahuila	31

TRADE

Export trade in minerals during 1970 was valued at $195.0 million and mineral imports at $116.2 million, resulting in a favorable balance of mineral trade of $78.8 million.[4] Metallic minerals valued at $134.2 million accounted for 68.8 percent of the value of mineral exports, and nonmetallics valued at $60.8 million accounted for the remaining 31.2 percent. The combined export value of five metallic minerals contributed 84 percent of total value, as follows: Zinc, 26 percent; silver, 23 percent; lead, 20 percent; mercury, 9 percent, and copper, 6 percent. Of the nonmetallic mineral exports, fluorite accounted for 47 percent of the total value and sulfur for 27 percent.

Mineral imports in 1970 were valued at $116.2 million, made up of $70.3 million in metallic minerals and $45.9 million in nonmetallics. Chief imports of metallic minerals by value were of iron in various forms, but mainly of scrap, 68 percent, and tin, 11 percent. The most valuable of nonmetallic imports contributing to the total were coke, 29 percent; asbestos, 20 percent, and phosphates, 14 percent.

Nearly 54 percent of mineral exports, by value, went to the United States, and nearly 85 percent of such imports came from the United States.

In 1971 estimated value of mineral commodity exports amounted to $203.4 million, and imports were valued at $99.5 million, giving Mexico a favorable balance of mineral trade of $103.9 million.[5]

Of metallic mineral exports, the following five commodities accounted for 85 percent of the total value: silver, 27 percent; zinc, 26 percent; lead, 16 percent; copper, 9 percent, and mercury, 7 percent. The chief exports of nonmetallic minerals, which contributed 85 percent of the total value were fluorite, 53 percent; sulfur, 20 percent; and salt, 12 percent.

Eighty-six percent of the total value of metallic mineral imports was supplied by iron in various forms (but mostly scrap), 62 percent; tin, 11 percent; and nickel, 13 percent. Of nonmetallic mineral imports, 71 percent by value were supplied by the following commodities: Asbestos, 18 percent; phosphate rock, 15 percent; coke, 14 percent; talc, 12 percent, and coal, 12 percent.

Of the total value of mineral trade in 1971, 57.3 percent went to the United States, and the United States supplied 75.6 percent of mineral imports to Mexico.

The following tabulation shows selected commodities in mineral trade as a percentage value of total mineral trade for 1970 and 1971.

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[4] Anuario Estadístico de la Mineria Mexicana 1970. Consejo de Recursos Naturales No Renovables. Mexico, D.F., 1971, 112 pp.

[5] Page 133 of work cited in footnote 2.

	1970	1971
EXPORTS		
Metals:		
Zinc	26	26
Silver	23	27
Lead	20	16
Mercury	9	7
Copper	6	9
Other	16	15
Total	100	100
Nonmetals:		
Fluorite	47	53
Sulfur	27	20
Salt	14	12
Other	12	15
Total	100	100
IMPORTS		
Metals:		
Iron	[1] 68	[1] 62
Tin	11	11
Nickel	7	13
Other	14	14
Total	100	100
Nonmetals:		
Asbestos	20	18
Coal	8	12
Coke	29	14
Phosphates	14	15
Talc	8	12
Other	26	29
Total	100	100

[1] Mainly scrap.

Table 3.—Mexico: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum:			
Oxide (alumina)	14	1	Mainly to Colombia.
Metal including alloys, all forms	609	820	Argentina 350; Colombia 303.
Antimony:			
Ore and concentrate, metal content	8,528	15,670	United States 15,255.
Metal including alloys, all forms	265	167	United States 68; Panama 45; Taiwan 21.
Arsenic:			
Oxide, white	5,360	6,645	Mainly to United States.
Oxide, black	1,182	327	All to United States.
Bismuth metal, including alloys, all forms, bismuth content	697	693	United States 410; Panama 67.
Cadmium:			
Concentrate and speiss, metal content	4	2	All to Brazil.
Flue dust, metal content	838	739	All to United States.
Metal	237	252	United States 190; Netherlands 37; Brazil 20.
Copper:			
Ore and concentrate, metal content	4,156	536	All to United States.
Copper sulfate	209	199	United States 138; Brazil 61.
Metal including alloys, all forms	16,031	6,570	Japan 2,793; United States 2,458.
Gold troy ounces	3,177	2,679	All to United States.
Iron and steel:			
Ore and concentrate, metal content	24	359	United Kingdom 214; West Germany 48.
Metal:			
Scrap	950	2,643	Mainly to United States.
Steel primary forms, ingots	9	115	United States 99; Italy 15.
Semimanufactures	189,818	192,790	United States 166,549.
Lead:			
Ore and concentrate, metal content	1,302	1,579	All to United States.
Oxides:			
Litharge	39,976	32,674	United States 13,169; Italy 7,953; Netherlands 4,324.
Red lead	7,071	8,001	United States 5,519; Colombia 789; Netherlands 389.

See footnotes at end of table.

Table 3.—Mexico: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS—Continued			
Lead—Continued			
Metal including alloys:			
Antimonial and other bars	11,125	10,036	Netherlands 7,802; Colombia 560.
Refined bars	72,968	77,636	United States 30,661; Italy 23,886; Netherlands 7,629.
Semimanufactures	1,042	1,173	United States 1,103; Canada 50; Venezuela 20.
Manganese ore and concentrate, metal content	4,198	24,355	United States 23,874.
Mercury ... 76-pound flasks	32,141	35,012	Japan 9,340; United States 8,209; Netherlands 7,600.
Molybdenum concentrate, metal content	54	(1)	NA.
Nickel, metal including alloys	12	1	All to Colombia.
Selenium, elemental	34	32	Panama 21; France 7.
Silver metal ... thousand troy ounces	27,653	17,262	Switzerland 6,700; United States 5,548.
Tin metal, semimanufactures ... long tons	--	1	Mainly to Costa Rica.
Titanium ore and concentrate, metal content	3	NA	
Tungsten concentrate, metal content	503	459	United Kingdom 278; United States 159.
Zinc:			
Ore and concentrate, metal content	313,615	326,250	United States 275,439; Japan 46,683.
Oxide white	5,825	5,930	United States 5,700; Colombia 177.
Sulfate	5,476	3,249	United States 3,111; Canada 137.
Metal, including alloys:			
Powder	1,052	986	Argentina 985.
Unwrought	41,265	38,142	Brazil 16,747; United States 6,800.
Other metals and metallic residues	875	800	All to United States.
NONMETALS			
Abrasives, natural:			
Emery	19	21	West Germany 20; United States 1.
Pumice	375	95	United States 63; Brazil 32.
Asbestos	3	11,175	Mainly to Israel.
Barite and witherite ... thousand tons	114	117	United States 116; Colombia 1.
Calcite, optical ... kilograms	7	--	
Cement	55,782	97,837	United States 84,634; Brazil 12,800.
Clays and products, crude n.e.s.:			
Bentonite	2,801	32	Guatemala 20; Venezuela 11.
Fuller's and other earths	4,475	6,059	Brazil 1,540; Peru 1,479; Colombia 1,195.
Kaolin (china clay)	23	121	West Germany 107; Venezuela 14.
Other clays including refractory	105	--	
Diatomite, infusorial earth, tripoli and chalk	6,371	6,246	Argentina 1,796; Venezuela 794; West Germany 600.
Feldspar	1	(1)	NA.
Fertilizer materials:			
Crude phosphatic	22,486	13,182	All to United States.
Manufactured:			
Nitrogenous, including ammonia and urea	20,179	18,891	United States 7,247; Guatemala 4,848.
Phosphatic	61,036	148,741	United States 66,467; Chile 39,616.
Potassic	2,827	139	All to Guatemala.
Other including mixed	6,037	6,951	Guatemala 6,041.
Fluorspar:			
Acid grade	313,140	319,347	United States 318,576.
Metallurgical grade	662,205	600,117	United States 457,896; Canada 137,389.
Graphite, natural	39,309	45,696	Mainly to United States.
Gypsum:			
Crude ... thousand tons	1,038	1,056	United States 855; Taiwan 77; Japan 50.
Calcined	21	10	Guatemala 5; El Salvador 2; United States 2.
Lime	142	79	All to United States.
Mica, all forms	48	4	Do.
Perlite	620	654	Colombia 274; Peru 170; Venezuela 136.
Precious and semiprecious stones, except diamond ... kilograms	160	170	Japan 109; Hong Kong 30; Colombia 24.
Salt ... thousand tons	3,582	3,406	Japan 2,372; United States 763.
Stone, sand and gravel:			
Dimension stone	25,087	8,867	Mainly to United States.
Calcite, industrial	744	255	All to Guatemala.
Crushed rock	162	58	All to United States.
Limestone and dolomite	181	206	Do.
Quartz	37	300	Do.
Sand and gravel	14,736	26,727	Guatemala 26,093; United States 561.
Strontium minerals	18,066	27,537	All to United States.
Sulfur, elemental, all forms ... thousand tons	1,158	662	United States 513; United Kingdom 101.
Talc, soapstone, and pyrophyllite	90	16	Mainly to Nicaragua.
Wollastonite	1,677	2,078	United States 2,029; Guatemala 49.

See footnotes at end of table.

Table 3.—Mexico: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and natural bitumen	223	159	United Kingdom 128; Spain 21; Denmark 10.
Carbon black	36	31	Mainly to Costa Rica.
Coal and coke	2,411	2	All to United States.
Gas, natural million cubic feet	48,754	41,836	Do.
Petroleum:			
Refinery products:			
Gasoline thousand 42-gallon barrels	8	10	All to Trinidad and Tobago.
Distillate fuel oil do	221	41	United States 10; Japan 7.
Gas oil do	1	2	Mainly to People's Republic of China.
Residual fuel oil do	18,398	18,020	United States 17,354.
Lubricants do	600	1,239	United States 861; Guatemala 201.
Mineral jelly and wax do	5,656	8,911	Mainly to United States.

NA Not available.

[1] Less than ½ unit.

Source: Secretaría de Industria y Comercio Dirección General de Estadística. Anuario Estadística del Comercio Exterior de los Estados Unidos Mexicanos. 1970, 824 pp.; 1971, 844 pp.

Table 4.—Mexico: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum:			
Bauxite and concentrate	18,836	25,514	United States 22,771; Guyana 2,742.
Oxide and hydroxide	72,931	81,363	Mainly from United States.
Metal including alloys, all forms	9,963	10,480	Do.
Antimony metal and alloys, all forms kilograms	31	47	United States 46; Netherlands 1.
Arsenic:			
Trioxide, pentoxides, and acids	7	4	All from United States.
Metal including alloys, all forms	24	66	United States 62; Sweden 3.
Beryllium metal and alloys, all forms	44	47	All from United States.
Bismuth metal alloys, all forms kilograms	141	175	United States 170; Italy 4; Netherlands 1.
Cadmium metal and alloys, all forms do	18	24	United States 21; West Germany 3.
Chromium:			
Chromite	34,002	24,999	Mainly from United States.
Oxide and hydroxide	461	430	United States 167; West Germany 157; Denmark 63.
Cobalt oxide and hydroxide	76	136	Belgium-Luxembourg 58; Canada 55; United Kingdom 19.
Copper, metal including alloys:			
Scrap	9	19	West Germany 14; United States 2.
Unwrought	22	13	United States 10; United Kingdom 3.
Semimanufactures	743	859	United States 352; West Germany 301; Sweden 100.
Gold metal, unworked or partly worked troy ounces	57,157	36,748	United States 31,958; West Germany 4,565.
Iron and steel:			
Ore and concentrate	204,369	184,525	United States 126,705; Brazil 38,814; Panama 19,006.
Metal:			
Scrap	490,993	721,698	Mainly from United States.
Pig iron, ferroalloys and similar materials	5,987	6,429	United States 5,478; Brazil 539.
Steel primary forms	93,049	79,091	United States 72,221; Venezuela 5,499.
Semimanufactures	197,390	192,676	United States 112,644; Canada 33,213; Japan 20,716.
Lead:			
Oxides	8	67	All from United States.
Metal including alloys	101	143	Mainly from United States.
Magnesium, metal including alloys, all forms	674	1,434	United States 1,182; Canada 251.
Manganese oxides	2,442	2,432	United States 1,241; Japan 1,101.
Mercury 76-pound flasks	26	33	United States 23; Netherlands 9.
Molybdenum:			
Ore and concentrate	14	34	United States 18; Canada 16.
Metal including alloys, all forms	4	5	United States 4.
Nickel:			
Matte, speiss and similar materials	151	490	Canada 276; United States 200.
Metal including alloys, all forms	858	1,130	United States 622; Canada 268; West Germany 60.

See footnotes at end of table.

Table 4.—Mexico: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS—Continued			
Platinum-group metals including alloys, all forms troy ounces	5,705	6,392	United States 4,299; France 662; United Kingdom 490.
Selenium, elemental kilograms	12	7	United States 5; United Kingdom 2.
Silver, metal including alloys troy ounces	27,756	38,604	United States 34,005.
Tantalum metal, all forms kilograms	3	80	All from United States.
Tellurium, elemental do	579	943	Argentina 811; United States 132.
Tin:			
Ore and concentrate long tons	2,218	2,512	United States 2,202; Bolivia 285.
Oxide do	76	96	United Kingdom 74; United States 20.
Metal including alloys, all forms do	654	464	United States 446.
Titanium:			
Ore and concentrate	763	762	Australia 414; United States 348.
Oxide	355	603	Mainly from United States.
Slag and residues	20,978	25,771	All from Canada.
Tungsten, metal including alloys, all forms	16	27	Mainly from United States.
Zinc, metal including alloys, all forms	56	143	United States 74; West Germany 34; Belgium-Luxembourg 22.
Zirconium ore and concentrate	2,775	2,426	Australia 2,133; United States 272.
Other:			
Ore and concentrate not elsewhere specified	20	119	Mainly from United States.
Ash, cinder and other metallurgical residues containing nonferrous metals, n.e.s	92	535	Do.
Metals and alloys, unwrought n.e.s	307	307	United States 278; Belgium-Luxembourg 23; Japan 5.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	929	683	United States 570; Netherlands 76.
Dust and powder of precious and semiprecious stones except diamond kilograms	7	3	West Germany 2; Belgium-Luxembourg 1.
Grinding and polishing wheels and stones	118	123	United States 80; United Kingdom 28; West Germany 12.
Asbestos, crude	36,820	40,460	Canada 24,857; United States 6,878.
Barite and witherite	99	95	United States 65; West Germany 30.
Boron materials, oxide and acid	1,194	1,698	Mainly from United States.
Bromine	51	68	United States 67.
Cement	3,076	3,103	United States 2,517; West Germany 530; United Kingdom 55.
Chalk	49	55	United States 54; West Germany 1.
Clays, crude:			
Fuller's earth	278	92	United States 54; West Germany 37.
Kaolin (china clay)	20,327	23,317	United States 23,057; Czechoslovakia 110.
Refractory	108,213	111,424	United States 109,491; France 1,701.
Other	788	806	United States 804.
Cryolite	79	27	Denmark 26; United States 1.
Diamond:			
Gem, not set or strung carats	6,785	12,925	United States 5,270; Belgium-Luxembourg 4,095; Netherlands 1,870.
Industrial stones do	80,000	5,450,000	All from United States.
Powder and dust do	205,000	220,000	United States 210,000; Belgium-Luxembourg 10,000.
Diatomite	143	1	Mainly from United States.
Feldspar and nepheline syenite	2,248	1,123	United States 1,031; Canada 92.
Fertilizer materials:			
Crude phosphatic rock	629,758	825,001	United States 785,158; Israel 39,843.
Manufactured:			
Nitrogenous	88,383	32,751	United States 15,040; Chile 12,558; Costa Rica 5,040.
Phosphatic	14,589	13,022	All from United States.
Potassic	68,129	71,678	United States 64,479; West Germany 7,193.
Mixed	7,626	6,790	Chile 6,580; United States 147; Canada 49.
Fluorspar	10	--	
Graphite, natural	162	215	United States 190; West Germany 25.
Gypsum	21,106	20,301	United States 20,251.
Iodine	105	58	Chile 54; Belgium-Luxembourg 1.
Lime	8,630	5,996	United States 5,982.
Magnesite	12,964	31,856	United States 31,796; Brazil 50; Belgium-Luxembourg 8.
Mica, all forms	268	266	United States 189; Argentina 47; Brazil 20.
Pigments, mineral including processed iron oxides	37	333	United States 206; West Germany 117.
Precious and semiprecious stones, except diamond kilograms	1,496	1,231	France 486; Switzerland 382; United States 151.

See footnotes at end of table.

Table 4.—Mexico: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
NONMETALS—Continued			
Pyrite, unroasted	12	163	United States 150; West Germany 13.
Salt	814	623	Mainly from United States.
Sodium and potassium compounds:			
Caustic soda	1,866	14,215	United States 14,161.
Potassium hydroxide	777	823	Belgium-Luxembourg 299; United States 291; West Germany 201.
Stone, sand and gravel:			
Dimension stone, roughly worked	6,227	6,478	Italy 5,920; United States 331; Greece 147.
Dolomite, calcined	55	9	All from West Germany.
Gravel, crushed stone and paving stone	2,606	1,134	United States 1,031.
Sand	157,795	182,474	United States 181,011.
Quartz	73	259	Switzerland 88; United States 81; West Germany 65.
Strontium minerals	1	80	All from Australia.
Sulfur	831	966	All from United States.
Talc, soapstone, and pyrophyllite:			
Steatite	58,871	67,010	United States 64,640; Italy 1,888; Canada 307.
Talc	257	277	United States 155; Italy 120.
Pyrophyllite	176	222	All from United States.
Vermiculite	511	630	Do.
Other nonmetallic minerals	5	(1)	NA.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt	535	1,280	Mainly from United States.
Coal including lignite	115,232	153,114	United States 153,049.
Coke	541,977	340,191	United States 339,977; West Germany 123; Canada 89.
Gas, hydrocarbon:			
Natural gas ....million cubic feet	12,004	14,678	All from United States.
Natural gas liquids thousand 42-gallon barrels	7,223	8,085	United States 7,838; Venezuela 246.
Petroleum:			
Crude ....do	(1)	--	
Refinery products:			
Gasoline ....do	2,031	2,378	Netherlands Antilles 2,052; United States 94.
Kerosine ....do	207	177	All from United States.
Distillate fuel oil ....do	2,014	2,184	Netherlands Antilles 704; Venezuela 700; United States 513.
Residual fuel oil ....do	1,074	1,718	United States 1,571; Netherlands Antilles 146.
Lubricants ....do	546	313	Mainly from United States.
Mineral jelly and wax ....do	250	263	United States 238.
Other ....do	1,262	1,219	Mainly from United States.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	15,610	16,257	Do.

NA Not available.

[1] Less than ½ unit.

Source: Secretaría de Industria y Comercio Dirección General de Estadística. Anuario Estadística del Comercio Exterior de los Estados Unidos Mexicanos. 1970, 824 pp.; 1971, 844 pp.

COMMODITY REVIEW

METALS

Copper.—With the purchase of a 51-percent interest in Cía. Minera de Cananea, S.A. de C.V., by Mexican capital, the last major mining company in the country was Mexicanized under terms which were described as "mutually satisfactory." The Anaconda Company retained a 49-percent interest in Cananea; Comisión de Fomento Minera and Nacional Financiera, S.A., each obtained 13 percent, and the remaining 25-percent participation was distributed in varying amounts among private Mexican investors, including employees of the company.

With Mexican control, Cananea will no longer be obligated to pay the production tax on copper and will have better means of financing the planned expansion. Cananea produced over one-half of Mexico's copper with output of 37,691 tons in 1970. Announced plans called for investment of $24 million by the end of 1973, which was expected to raise capacity to 65,000 tons per year; a further planned investment of $100 million could increase capacity to 140,000 tons per year.

Expansion plans were supported by estimated reserves of 825 million tons, averaging 0.73-percent copper metal.[6]

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[6] World Mining. V. 7, No. 11, October 1971, p. 70.

The legal headquarters of Cananea were to be transferred to Mexico City where Eduardo Prieto Lopez, Chairman of the Board of the Company will assume the additional responsibility as Director General; William A. Humphrey was to be Executive Vice-President and General Manager headquartered at Cananea.[7]

The feasibility study which was done by Parsons-Jurden Corp. for Cía Mexicana de Cobre, S.A., reportedly recommended that La Caridad porphyry copper deposit be put into production with the establishment of a fully integrated operation.[8]

About $300 million would be required to develop the open pit mine and infrastructure to support a 60,000-ton-per-day mill with smelter and electrolytic refinery.

Proven open pit reserves were determined at 700 million tons of ore grading between 0.70-and 0.80-percent copper.

Asarco Mexicana, S.A., started work to expand the capacity of its copper smelter from 2,000 to 3,500 tons per month. The smelter was situated in San Luis Potosí. The new mill at the Inguarán mine began operating during the first quarter of 1971 at the rate of 2,200 tons of copper ore per day.

Mid-West Mines Ltd. planned[9] an exploration program on a 52-acre tract near Culiacán, Sinaloa. Preliminary estimates gave 326,000 tons of ore averaging 2-percent copper which could be mined by open pit methods; silver values could be recovered as well. Mid-West reportedly held an option to purchase a 49-percent interest in a Mexican company that was being formed to acquire the property.

Chibougamau Mining and Smelting Co. and Metron Exploration Ltd. (Chimet) of Canada reportedly[10] acquired two groups of claims in Sonora, about 170 miles south of Tucson, Ariz. A $50,000 geological program was begun to appraise what was termed a typical quartz porphyry copper deposit, and a tungsten prospect (see Tungsten). If the prospects develop into mining properties, a Mexican company will be formed to conform with Mexican law.

Iron Ore.—Cía. Fundidora de Fierro y Acero de Monterrey, S.A. (Fundidora), shipped 1,073,677 metric tons of iron ore from four mines in 1971; this was an increase of 22 percent compared with 1970 shipments. The following tabulation lists 1971 shipments in metric tons, by mine:[11]

Durango	804,422
Hercules	201,005
El Mamey	43,870
Zaniza	24,380
Total	1,073,677

The longest distance that any ore was shipped was from the Zaniza mine in Oaxaca—1,050 miles from Monterrey. Fundidora was studying proposals for an iron ore pelletizing plant to be built in Monterrey to process ore from its mines in Durango and Coahuila. Based on preliminary estimates, the plant would produce about 1.5 million tons of pellets annually for an investment of $30 million.

Las Encinas, S.A., an affiliate of Hojalata y Lámina, S.A. (HYLSA), commenced its iron ore pelletizing operations in 1970; the plant is situated at Alzada railway station about 13 miles from the mine. In 1971, the first full year of operation, 873,000 tons of pellets were produced averaging 66.8-percent iron and 2.2-percent silica. Rated capacity of the plant was 1.1 million tons per year. Of the total output, 458,100 tons and 352,400 tons were shipped to HYLSA sponge iron plants in Monterrey and Puebla, respectively, with the remaining 62,500 tons going to Tubos de Acero de Mexico, S.A. (TAMSA), in Vera Cruz.

At yearend Arthur G. McKee and Co. and Altos Hornos de Mexico S.A. (AHMSA) had agreed in principle to the design and erection of a circular grate iron ore pelletizing plant at La Perla mine in Chihuahua. The facility will include the concentrator and equipment for annual output of 600,000 tons of pellets. The circular grate pelletizing system was reported as the first of its type in the world.[12] Completion of the plant was scheduled for early in 1974.

Consorcio Minero Peña Colorada called for bids for the development of the Peña Colorada iron ore deposits; the consortium is composed of Nacional Financiera, AHMSA, TAMSA, Fundidora and HYLSA.

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[7] Skillings Mining Review. V. 60, No. 45, Nov. 6, 1971, p. 18.

[8] World Mining. V. 24, No. 9, August 1971, p. 57.

[9] World Mining. V. 7, No. 4, April 1971, p. 53.

[10] Mining Journal (London). V. 277, No. 7102, Oct. 1, 1971, p. 301.

[11] Skillings Mining Review. V. 61, No. 14, Apr. 1, 1972, p. 15.

[12] Skillings Mining Review. V. 60, No. 50, Dec. 11, 1971, p. 14.

The feasibility study and related work cost about $2.5 million.

The Peña Colorada deposits, situated in the State of Colima, have proven reserves of nearly 107 million tons of ore averaging 47.62-percent iron. The deposits are in four separate units, of which three were included in the main project; El Espinazo del Diablo (24 million tons) would be developed first, followed by El Chinforinazo (61 million tons) and La Encantada (22 million tons). La Primorosa, which was rated at 6 million tons, was not included in the original plans for production.

Concentrates would be piped as a slurry from San Juanes to a pelletizing plant to be built near Manzanillo, a distance of about 30 miles. Planned capacity of the pelletizing plant was 1.5 million tons per year, grading 67-percent iron.

Total cost of the entire project, including working capital, was estimated in the range of $50 to $60 million.

Iron and Steel.—It was reported that some site work had been started at Cía. Siderúrgica Lázara Cárdenas—Las Truchas, S.A. (SICARTSA), but actual construction was being delayed until financing had been arranged. The integrated steel complex was to be based on the Las Truchas iron ore deposits in Michoacán which were rated at 300 million tons of proven reserves; possible and probable ore reserves were estimated at an additional 200 million tons.

International bids for 11 sections of the ore processing and steel works were to be solicited. Specifications for design and equipment were to be kept flexible in order to allow the very latest technology to be incorporated into the planning. The first stage construction capacity was planned for 1.5 million tons of steel with the second stage, to be built at a later date, for an additional 1.5 million tons.

Housing, and other amenities, for the workers was to be provided. It was expected that some financing would be obtained from international business and banking sources.

TAMSA was granted a loan of $2.67 million by the Export-Import Bank (Eximbank) to finance expansion at its works located in Vera Cruz. TAMSA planned to install a fourth electric furnace which would increase ingot capacity from 300,000 to 400,000 tons per year. Eximbank was to provide guarantees for further loans to the company.

HYLSA contracted with Usiná Siderúrgica da Bahia, S.A. (a Brazilian firm), to supply technology for a direct reduction plant to be built in northeastern Brazil. The plant's planned capacity was for 600 tons per day and would operate on pellets supplied from Brazilian sources.

HYLSA also agreed to supply its sponge iron process to Corporacíon Minera de Bolivia, S.A., for inclusion in Bolivia's projected steel complex.

Lead.—Industrias Peñoles, S.A., announced[13] that its subsidiary, Met-Mex Peñoles, S.A., had contracted with Minero Perú to process between 90,000 and 112,500 tons of Peruvian lead concentrates annually at Peñoles' plants in Torreón and Monterrey. The initial contract was for a term of 5 years.

Tungsten.—Chimet (see copper) was appraising a tungsten deposit in Sonora, about 170 miles south of Tucson, Ariz. Preliminary sampling revealed associated fluorite and beryl. Geological work was continuing.

NONMETALS

Cement.—Cementos Mexicanos, S.A., reportedly produced more than 425,000 tons of portland and white cement per year at its plant in Monterry; branch plants in Torreón and at San Luis Potosí produced about 180,000 tons per year. A subsidiary, Cementos Maya, S.A., was building a plant in Mérida, Yucatan, to produce 180,000 tons per year. Cementos del Norte, S.A., jointly owned with Fundidora, produced about 140,000 tons per year of slag and portland cement.

Work was in progress to double the capacity of the main plant of Cementos Mexicanos, S.A. in Monterrey, and the branch plant in Torreón.

Cementos Guadalajara, S.A., and Cementos California, S.A., merged in 1971 creating a single company with daily production of over 4,000 tons. Plants were located in the States of Jalisco and Guanajuato and in Baja California; a new plant, to produce 1,200 tons per day, was planned in Sinaloa.

Expansion of capacity was planned by Cementos de Sinaloa, S.A., from 400 tons to 1,200 tons per day, and by Cementos Atozac, S.A., which will double its capacity to 400 tons per day. Other plants planned expansion which will add daily production of 10,800 tons of cement.

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[13] Industrias Peñoles, S.A. Informe Anual 1971 (Annual Report 1971), p. 13.

In 1971 all cement companies changed their corporate bylaws to meet the legal requirement of 51-percent Mexican ownership.

Fluorite.—A number of major companies announced plans to make anhydrous hydrofluoric acid (HF) based on Mexican fluorite deposits. Total planned capacity could attain over 200,000 tons per year, most of which was to be exported.

Union Carbide Corp. was to build a 35,000-ton-per-year plant at Apodaca through its Mexician subsidiary, Union Carbide Mexicana, S.A. Eximbank reportedly was to loan $2.7 million to the Mexican company to help finance the project.[14]

Continental Ore Corp., a subsidiary of International Minerals & Chemical Corp., planned an HF plant near Matamoros to produce 70,000 tons per year. The plant will be owned by Química Mexicana, H.F., S.A., of which the majority ownership was to be held by Mexican interests. It was estimated that when full capacity was attained about $20 million per year would be generated in foreign exchange earnings.

Quimobásicos, S.A.,, with minority interest held by Allied Chemical Corp., was producing about 3,000 tons of anhydrous and aqueous HF per year but was reportedly planning to build a new plant of 35,000 tons per year.

Química Fluor, S.A. de C.V., was formed for the purpose of establishing a $40 million plant to produce 70,000 tons of HF per year; ownership of the company was distributed as follows: E. I. du Pont de Nemours & Co., 33 percent; Minera Frisco, S.A., 33 percent; Financiera Bancomer, 17 percent; and Comisión de Fomento Minero, 17 percent. The plant was to be situated at Matamoros on the Texas border. In addition to its financial obligation, du Pont was to supply engineering and other technical expertise.

Mitsui Mining and Smelting Co. announced that it intended to supply 50 percent of the necessary capital with La Questa Co. to develop the Santa Rosa fluorite mine in northwestern Mexico. Reserves were estimated at 700,000 tons of ore averaging 40-percent CaF_2. Production was planned for 30,000 tons of acid grade concentrate per year. All of the output was to be exported to Japan.

MINERAL FUELS

Petroleum.—Petróleos Mexicanos (Pemex) reported that production of crude oil, condensate, and liquids totaled 177.3 million barrels, a slight decline of 0.18 percent from the production level of 1970. Gas production declined by 3.25 percent, to 643,416 million cubic feet. Reserves of crude oil, condensate, and gas converted to liquid equivalent were 5.4 billion barrels on December 31, 1971, a net loss of 139 million barrels. The reserve represents about 18 years' requirement at the present rates of production.

The following tabulation presents salient statistics for Pemex during 1971:

Production:	
Crude oil, million barrels	155.9
Other liquids, do	21.4
Gas, million cubic feet	643,416
Petrochemicals, million tons	1.9
Reserves, billion barrels	5.4
Refinery capacity, barrels per day throughput	592,000
Refinery output, million barrels per year	177.7
Imports:	
Gasoline, million barrels	5.7
Diesel fuel, do	3.9
Employees	69,000
Tanker fleet:	
Number of ships	22
Deadweight tons, total	364,975
Capacity, million barrels	2.7
Pipelines, billion ton per kilometer per year	14.8
Highway tank trucks	500
Railway tank cars [1]	1,190
Airplanes	19
Helicopters	12

[1] Additional 2,400 rented by Pemex.

Because of the falling reserve situation, particular effort was made to discover areas which might contain medium and large reserves. Exploration was carried out in Oaxaca, Chiapas, and northern Chihuahua. In addition to geological and geophysical work, stratigraphic tests were drilled in selected areas. In spite of the considerable effort made, there remained much work to be done in the 200,000-square-kilometer prospective area.

Pemex drilled 129 exploration tests and 387 development wells; of the total 516 wells drilled, 164 were unproductive. The 516 wells drilled in 1971 compared with 523 drilled in 1970; average depth per well in 1971 was 2,552 meters and 2,417 meters in 1970.

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[14] Wall Street Journal. V. 78, No. 30, Aug. 8, 1971, p. 5.

During 1971 Pemex had 73 exploration parties in the field. These parties included 23 devoted to seismograph work and 27 and 16 doing surface and subsurface geology, respectively; the remaining parties were made up of gravity, magnetometer, and magnetometer-gravity meter crews. In addition, a triangulation and level control party operated as backup for the field exploration groups.

Taking cognizance of pollution factors that may be caused by petroleum and petrochemical operations, Pemex formed the Comité de Protección Ambiental de Petróleos Mexicanos; the committee is made up of 120 professionals of various technical backgrounds representing all facets of the company. The Oficina de Protección Ambiental coordinates the activities of the committee and the work of control and development. All levels of workers were reached through a series of seminars and conferences on pollution problems. A program of listing the sources of pollution from refineries was started in order to recognize the scope of the problem. Operation of the Azcapotzalco refinery was cleaned up by means of a fumeless gas burner.

The Mineral Industry of Morocco

By Ted C. Briggs [1]

Minerals continued to account for over 30 percent of the value of Moroccan exports in 1971. However, there has been a tendency toward stagnation of the mineral industry in recent years, with the notable exception of phosphates. This stagnation is mainly due to the exhaustion of many deposits and weakened prices for a number of minerals. Prospects for a dramatic improvement in mineral production and exports were not particularly favorable at yearend.

While several mines faced serious depletion or exhaustion of reserves, active exploration was underway on many fronts, and some new mines were being opened. Many mineral deposits have been identified from surface examination, but additional exploration, such as magnetic surveys and core samples, would be needed to determine where commercial-size ore bodies exist. Copper and lead appear to be the leading minerals for which new mines may be developed, but possibilities exist for silver, fluorite, rock salt, and nickel. Moroccan geology is so varied that other minerals may become important in the future, especially if mineral prices rise.

Moroccanization, announced in March 1970, was pursued cautiously in 1971. The Moroccan Government encourages minerals development through incentives such as tax reduction, customs exemptions, accelerated depreciation, equipment premiums, and guaranteed repatriation of foreign capital and profits. New foreign investment in Morocco is usually made via a joint venture with the Government-owned Bureau de Recherches et de Participations Minierès (BRPM). Usual terms provide that the BRPM obtains the necessary Moroccan Government permits and makes available all geological and mineralogical studies previously done, with the foreign partner conducting all subsequent detailed studies on the mineral deposit in question; exploitation would be on a joint 50-50 basis.

The Division of Mines of the Ministry of Commerce issues the mineral exploration permits which are valid for 3 years and renewable for an additional 4 years. Also, the Division of Mines issues the mineral exploitaton permits, which are valid for 4 years and renewable for a total of 28 years, or a concession may be granted to the holder of an exploration permit. For major deposits, concessions are issued for 75 years, or 50 years for petroleum, and the concessions are renewable for 25 years and revert to the State on expiration. BRPM requests permits from the Division of Mines in the same manner as a private party.

The Moroccan Government has tentative plans for developing various mineral projects in the future. Three new cement plants and the expansion of three others are included in these plans. Also, financing is being sought from the World Bank for a phosphoric acid plant, which will cost about $65 million. A plant to produce sodium and chlorine is planned. Perhaps the biggest project under consideration is a steel mill at Nador, and the Moroccan Government has been weighing at least two foreign proposals—one submitted by a French-American group and the other by an Italian group.[2]

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[1] Chemist, Division of Nonmetallic Minerals.

[2] U.S. Embassy Rabat, Morocco. State Department Airgram A–120, June 14, 1971, 9 pp.
———. State Department Airgram A–38, Feb. 16, 1972, 10 pp.

PRODUCTION

Mineral production in Morocco during 1971 was characterized, as in years past, by large fluctuations. Some minerals posted significant gains, whereas others showed precipitous reductions. Only a few minerals remained somewhat stationary in output.

Of the minerals showing an increase in production, cobalt concentrate headed the list, with a startling growth of 61.9 percent. This increase reflects a rapid recovery from the unusually low cobalt production in 1970, which was not in concert with the historical levels. Production of pyrrhotite jumped by 51.4 percent, probably as a result of increased demand for sulfuric acid which was used in the production of phosphoric acid from phosphate rock. Healthy production gains were noted for smectite (up 25.4 percent), anthracite (up 9.6 percent), copper concentrate (up 9.6 percent), natural gas (up 9.1 percent), and phosphate rock (up 5.3 percent).

Production of zinc concentrate fell by 30.9 percent, reflecting the continuing depletion of reserves. Production of iron ore fell by 28.6 percent; however, the iron industry should recover in a few years when new facilities become fully operational. Manganese ore and salt suffered significant declines in output, dropping 9.7 percent and 7.0 percent, respectively.

Minerals showing production changes of less than 2 percent include lead (up 1.4 percent), antimony (down 1.4 percent), and barite (down less than 0.1 percent).

Table 1.—Morocco: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1969	1970	1971 [p]
METALS			
Antimony concentrate:			
Gross weight	3,127	4,328	4,266
Metal content	1,407	1,973	1,920
Cobalt concentrate:			
Gross weight	14,097	6,039	9,777
Metal content	1,410	604	978
Copper:			
Concentrate:			
Gross weight	9,475	12,183	13,347
Metal content	2,274	2,873	3,150
Matte (byproduct of lead smelter)	NA	201	198
Iron ore, direct shipping, gross weight thousand tons	749	872	623
Lead:			
Concentrate:			
Gross weight	117,680	120,911	122,630
Metal content	70,608	73,063	74,069
Smelter, primary	26,836	24,901	18,716
Manganese ore:			
Metallurgical grade	10,444	--	--
Chemical grade	120,132	112,376	101,456
Total	130,576	112,376	101,456
Nickel:			
Content of cobalt ore	282	121	[e] 200
Content of nickel ore	--	17	--
Total	282	138	[e] 200
Silver primary [2] thousand troy ounces	861	681	952
Tin:			
Concentrate:			
Gross weight long tons	19	26	13
Metal content [e] do	10	14	7
Smelter, primary [e] do	12	12	12
Zinc concentrate:			
Gross weight	72,079	31,871	22,015
Metal content	33,877	18,074	12,483
NONMETALS			
Barite	86,940	84,750	84,474
Cement thousand tons	1,165	1,421	1,475
Clays, crude:			
Bentonite	7,638	6,486	3,801
Smectite	13,567	11,364	14,253
Other including fuller's earth	5,020	8,200	4,880
Fertilizer materials, crude, natural, phosphate rock thousand tons	10,662	11,399	12,008
Goethite	36	36	37
Halloysite	30	--	--
Pigments, mineral, ocher	--	510	--
Pyrrhotite:			
Gross weight	391,528	291,041	440,549
Sulfur content	117,458	87,312	132,165
Salt, all types	66,720	57,075	53,102
Talc	136	226	--
MINERAL FUELS AND RELATED MATERIALS			
Coal:			
Anthracite thousand tons	397	433	475
Briquets do	17	20	21
Gas, natural, marketed million cubic feet	1,484	1,539	1,680
Petroleum:			
Crude oil thousand 42-gallon barrels	445	335	172
Refinery products:			
Gasoline do	2,669	2,581	2,895
Jet fuel do	269	21	536
Kerosine do	631	589	333
Distillate fuel oil do	3,493	3,352	2,941
Residual fuel oil do	3,047	3,082	3,178
Other do	601	880	992
Refinery fuel and losses do	344	[e] 337	[e] 350
Total do	11,054	[e] 10,842	[e] 11,225

[e] Estimate. [p] Preliminary. NA Not available.

[1] In addition to the commodities listed, Morocco also produces manufactured phosphatic fertilizers and a variety of crude construction materials, but available information is inadequate to make reliable estimates of output levels.

[2] Entirely produced from domestic lead concentrates smelted in Morocco. Inasmuch as only about one-third of total lead concentrate output is smelted indigenously, actual mine output of silver (all in lead concentrates) is probably much higher, but data on silver content of exported concentrates are not available.

TRADE

Morocco exported 78 percent of the antimony, 75 percent of the copper, 92 percent of the iron ore and concentrate, 62 percent of the lead, 83 percent of the silver, and 78 percent of the smectite produced during 1970. Exports in 1970 exceeded production of cobalt, manganese, zinc, and phosphate rock which, of course, reduced stocks. Petroleum products overwhelmingly accounted for the major mineral imports into Morocco. Also, large amounts of nitrogenous and potassic fertilizers were imported. Significant amounts of cement and refractory materials were imported into Morocco.

Table 2.—Morocco: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum:			
Bauxite and concentrate	120	--	
Metal including alloys, all forms	653	656	Italy 229; West Germany 197; France 185.
Antimony ore and concentrate	2,816	3,383	Belgium-Luxembourg 1,298; France 670; Italy 454; Japan 291.
Chromium, chromite	--	13	All to France.
Cobalt ore and concentrate	15,350	8,750	France 6,750; People's Republic of China 2,000.
Copper:			
Ore and concentrate	14,688	9,127	West Germany 5,318; People's Republic of China 2,505.
Matte	--	--	
Scrap including alloys	1,216	1,342	West Germany 583; France 454; Italy 136.
Iron and steel:			
Ore and concentrate thousand tons	868	801	West Germany 416; Czechoslovakia 165; United Kingdom 79.
Roasted pyrites	--	238	Italy 158; Japan 80.
Metal:			
Scrap	[r]38,526	43,393	Italy 16,252; United Kingdom 9,395, France 6,694; West Germany 2,750.
Pig iron, ferroalloys and similar materials	[r]440	--	
Semimanufactures	2,405	2,065	Italy 1,962.
Lead:			
Ore and concentrate	75,502	75,224	France 46,659; West Germany 9,857; Hungary 4,831.
Crude unalloyed	25,080	22,562	France 19,180; Italy 1,828.
Magnesium including alloys, all forms	6	--	
Manganese ore and concentrate	132,460	115,455	United States 31,496; France 25,463; Netherlands 23,617.
Nickel including alloys, all forms	57	133	Algeria 86; France 24; Netherlands 22.
Silver, all forms troy ounces	[r]848,915	567,209	All to France.
Tin, all forms long tons	1	5	Algeria 2; Senegal 2.
Tungsten, all forms	(1)	--	
Zinc:			
Ore and concentrate	75,502	37,501	United Kingdom 19,193; Belgium-Luxembourg 12,894.
Metal, scrap	--	22	France 22.
Other:			
Ore and concentrate	1,997	6,575	France 6,575.
Ash, slags, and residues	2,014	2,360	Belgium-Luxembourg 1,837.
Oxides	5	3	Algeria 1; Libya 1.
NONMETALS			
Abrasives, grinding and polishing wheels and stones	1	(1)	All to France.
Barite	86,933	70,792	United Kingdom 32,605; United States 22,352.
Cement	11,816	12,732	NA.
Clays and products (including refractory brick):			
Bentonite	746	533	Ships stores 388; United Kingdom 145.
Fuller's earth	2,880	4,220	Tunisia 3,151; Algeria 1,067.
Refractory	1,829	3,726	NA.
Smectic	12,380	8,828	Spain 6,644.
Other	1,801	220	Spain 190; Algeria 30.
Fertilizer materials:			
Crude, phosphatic thousand tons	10,295	11,537	France 1,597; United Kingdom 1,312; Spain 1,241; Netherlands 1,194; Poland 852.
Manufactured:			
Phosphatic do	183	105	Bulgaria 30; Cuba 30; Algeria 16, France 10.

See footnotes at end of table.

Table 2.—Morocco: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
NONMETALS—Continued			
Fertilizer materials—Continued:			
Manufactured—Continued:			
Potassic	--	(1)	France.
Other including mixed	307	14,793	Italy 8,695; France 3,732; Libya 1,200.
Fluorspar	11	10	France 10.
Gypsum and plasters	78,379	104,659	Japan 54,498; Portugal 23,360; Senegal 15,138.
Lime	202	320	Gibraltar 59.
Pigments, mineral including processed iron oxides	30	66	France 66.
Salt and brines	106	3,061	United Kingdom 2,157; Other countries 904.
Sodium and potassium compounds, n.e.s	--	234	NA.
Stone, sand and gravel:			
Dimension, crude and partly worked	13,512	6,783	Italy 4,379; Belgium-Luxembourg 1,239.
Gravel and crushed rock	5,401	32,227	Gibraltar 14,450.
Sand, excluding metal bearing	21,789	26,477	NA.
Quartz and quartzite	--	5	France 5.
Sulfur, elemental, all forms	130	134	NA.
Other nonmetals, n.e.s., ash and slag	--	11	Mainly to Gibraltar.
MINERAL FUELS AND RELATED MATERIALS			
Coal and coke including briquets	52,371	59,979	Algeria 24,680; Italy 19,418.
Petroleum refinery products:			
Gasoline (including natural) 42-gallon barrels	32,814	77,806	Mainly to ships stores.
Kerosine and jet fuel do	2,516	33,336	All to ships stores.
Distillate fuel oils do	73,302	39,307	Do.
Residual fuel oils do	39,125	3	Do.
Lubricants do	177	2	Do.
LPG gases	--	789	All to Gibraltar.
Other	--	21	Cameroon 14; ships stores 7.

[r] Revised. NA Not available.
[1] Less than ½ unit.

Table 3.—Morocco: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum:		
Ore (bauxite) and concentrate	--	489
Oxide and hydroxide	732	725
Metal including alloys, all forms	3,083	3,478
Antimony including alloys, all forms	19	5
Arsenic:		
Natural sulfides	--	1
Trioxides, pentoxides and acids	38	16
Metal including alloys, all forms	1	(1)
Bismuth, crude kilograms	90	102
Cadmium, all forms do	222	511
Chromium:		
Oxides and hydroxides	21	14
Metal including alloys, all forms kilograms	15	48
Copper:		
Matte	(1)	--
Copper sulfate kilograms	328	512
Metal including alloys, all forms	2,705	3,287
Gold including alloys troy ounces	748	2,120
Iron and steel:		
Ore and concentrate	(1)	--
Roasted pyrites	900	1,250
Metal:		
Scrap	--	1
Pig iron, ferroalloys, etc	2,151	2,528
Semimanufactures	31,720	28,121
Castings and forgings	29	--
Lead:		
Unwrought	5	8
Semimanufactures	61	87
Magnesium including alloys, all forms	(1)	--
Manganese, oxide and dioxide	146	107
Mercury 76-pound flasks	(1)	54
Molybdenum, including alloys, all forms kilograms	103	328
Nickel:		
Scrap	4	4
Unwrought	2	3
Semimanufactures	335	408
Platinum group including alloys, all forms troy ounces	6	28
Silver including alloys do	13,512	12,524
Tin including alloys, all forms long tons	395	227
Titanium oxides	680	659

See footnotes at end of table.

Table 3.—Morocco: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS—Continued		
Zinc:		
Oxides	523	608
Metal:		
Unwrought	1,110	782
Blue powder	1	(1)
All forms including alloys	408	439
Others n.e.s.:		
Ash and residue of metals, n.e.s	380	--
Oxides, hydroxides, etc. of metals, n.e.s	5	16
Metals including alloys, all forms [2] ... kilograms	161	443
NONMETALS		
Abrasives, natural n.e.s	24	245
Asbestos	2,545	3,551
Barite	1	8
Boron materials:		
Crude natural borates	869	1,821
Oxide and acid	11	5
Cement	11,793	35,862
Chalk	2,522	2,717
Clays and products:		
Crude:		
Bentonite	(1)	(1)
Fuller's earth	6	335
Kaolin and refractory	11,530	12,169
Kyanite and sillimanite	28	26
Smectic	6,876	4,068
Others	180	370
Cryolite and chiolites	10	10
Diamond, industrial including powder and dust ... carats	10,000	--
Diatomite and other infusorial earths	1,069	678
Feldspar	129	118
Fertilizer and fertilizer materials:		
Crude and manufactured:		
Nitrogenous	96,050	67,485
Phosphatic	--	1
Potassic	26,543	31,562
Mixed	11,348	7,160
Ammonia	8,065	18,518
Graphite, natural	30	12
Lime	380	765
Magnesite	58	118
Mica:		
Crude including splittings and waste	16	27
Worked including agglomerated splittings	1	2
Pigments, mineral including processed iron oxides:		
Natural	370	998
Iron oxides, processed	521	1,088
Precious and semiprecious stones (except diamond) ... kilograms	329	489
Salt	(1)	30
Sodium and potassium compounds n.e.s	7,857	10,577
Stone, sand and gravel:		
Dimension	888	1,283
Dolomite	1,458	1,030
Gravel and crushed rock	60	71
Quartz and quartzite	53	26
Sand excluding metal bearing	12,587	17,567
Sulfur:		
Elemental	r 35,847	20,442
Sulfur dioxide	47	50
Sulfuric acid	11	40
Talc, steatite, soapstone, pyrophyllite	805	1,097
Other n.e.s.:		
Oxides and hydroxides of strontium, magnesium, barium	15	17
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	4	10
Gas carbon	2,030	2,061
Coal and coke, including briquets	76,491	65,343
Liquefied petroleum gas ... 42-gallon barrels	171,922	330,762
Hydrogen, helium and rare gases	6	13
Peat, including peat briquets and litter	3	33
Petroleum:		
Crude ... thousand 42-gallon barrels	r 10,588	11,393
Refinery products:		
Gasoline ... do	r 61	60
Kerosine and jet fuel ... do	r 315	465
Distillate fuel oil ... do	r 97	254
Residual fuel oil ... do	r 100	573
Lubricants ... do	r 188	196
Mineral jelly and wax ... do	131	120
Other, bitumen and asphalt ... do	r 373	483

r Revised.

(1) Less than ½ unit.

[2] Includes tungsten, tantalum, rare-earth metals.

COMMODITY REVIEW

METALS

Copper.—After completing initial work, Japan's Mitsui Mining and Smelting Co. Ltd. entered into the second phase of copper prospecting at the El Bleida mine south of Casablanca, in central Morocco. The company will continue exploration through core drilling for some months. Prospecting since early 1970 has delineated reserves of some 3 million tons of ore averaging 3 percent copper. If enough reserves are proven up, Mitsui, Nittetsu Mining Co. Ltd. and Moroccan interests will jointly develop the mine. Production is envisaged at 10,000 tons per year of contained copper.[3]

Iron.—The rich Moroccan iron deposits of Les Mines du Rif have only been worked extensively in this century. With the advance of technology worldwide, smelter specifications for iron ore and concentrate have tightened in a highly competitive market. In 1968, Wright Engineers Limited of Vancouver was retained by La Société d'Exploitation des Mines du Rif (SEFERIF) to prepare a technical and economic study on the future of the mines, and on the feasibility of producing high-grade iron pellets to the specifications now demanded by European smelters. Wright Engineers Limited was subsequently retained to provide overall engineering services and construction management for a new mining and beneficiation complex.

The Government-owned SEFERIF became the only active iron mining company in Morocco after buying out the Uixan, Axara, and Setolazar mines near Nador from two Spanish companies on January 1, 1968.

Depletion of open pit reserves has led SEFERIF to plan extensive underground development at Uixan, together with the construction of an ore concentration and pelletizing plant that will permit the use of lower grade ores.

The center of the new mining complex would be located 15 miles south-southwest of the Spanish enclave of Melilla on the Mediterranean coast, through which some 37 million tons of high-grade iron ore and concentrate had been shipped to European markets since mining operations commenced in 1915. Known reserves total about 32 million tons of ore analyzing 54.7 percent iron. Most of the iron occurs in the form of magnetite, but some hematite and pyrite are also present. The processing plant is designed to convert 1.54 million tons of crude ore per year into 945,000 tons of pellets assaying about 65 percent iron, 2.5 percent silica, and low in sulfur and phosphorus. About 80,000 tons of pyrites will also be produced annually. Completion of this combined beneficiation and pelletizing plant is expected in 1972.

The plant will have a 42- by 48-inch primary jaw crusher and a 24-foot mill in closed circuit with screens and cyclones. After initial magnetic separation, the rough iron concentrate will be reground in a 13- by 22-foot, 175,000 horsepower pebble mill to 75 percent 325 mesh and subsequently floated to remove residual pyrite. The final concentrate will be recleaned, if necessary, by further magnetic separation to ensure a high-grade concentrate. After filtration, the pellets will be prepared with bentonite in two 10-foot-diameter by 30-foot-long balling drums for subsequent firing in two 21-foot-diameter by 7-foot-long Midrex shaft furnaces. The finished pellets are to be transported by rail to Melilla for shipment.

Traditional buyers of Moroccan iron ore are Spain, West Germany, Czechoslovakia, and the United Kingdom.

A pyrite concentrate extracted from the rough magnetic separator tailings by flotation will also be sold to European consumers.

To implement the SEFERIF program to modernize and expand the iron industry, the bulk of the funds would come in the form of loans and credits from international sources, equipment would also be obtained almost totally from abroad, but excavating and concreting contracts would be awarded locally. Equipment purchases from the United States are expected to total approximately $5 million, to be financed mainly by an Export-Import Bank $2.1 million credit for 7.5 years at 6-percent interest, a First National City Bank of New York $1.1 million loan for 2.5 years at 7.5-percent interest, and an Agency for International Development loan for 10 years at 6.5-percent interest. Financing by the French include a French Government credit of $3.1 million for 20 years at 3 percent interest, French vendor credits of up to $4.5 million for 8 years at 7-percent interest, and a $1.1 million loan from the Banque Nationale de Développement Économique. Other financing includes Canadian credits of $3.3 million for 10 years at 6-percent interest, short-term vendor credits of $1.4 million from the United Kingdom and Sweden, and loans from domestic groups. Total costs to startup time are estimated at $22 million, with an additional $3.4 million of United States funds for expenses during the first 5 years of operation.

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[3] Mining Journal. Mitsui in Morocco. V. 277, No. 7091, July 16, 1971, p. 56.
———. Copper Prospecting in Morocco. V. 277, No. 7095, Aug. 13, 1971, p. 139.

According to financial projections based on a sales price of $0.235 per ton unit of iron, SEFERIF is expected to have a net revenue of $8 million during the first 10 years after payments of the loans. Annual foreign currency income after operating expenses, but before repayment of loans, is estimated at $9.1 million per year out of which will come loan repayment, further capital investment, and equity redemption.[4]

Tin.—Late in August 1971, a Moroccan firm reportedly was seeking an American partner for a joint venture to develop a tin deposit near Meknes, to which it holds the rights. The partner would be expected to provide equipment, technical expertise, and part of the capital. Equity in the company would be negotiable.

The deposit probably could support an annual output of at least 600 metric tons of 45-percent tin concentrate, but further exploration is necessary to confirm available reserves. The ore bodies are either eluvial or in veins. European mining geologists believe the property is worth commercial exploitation in spite of its small size. Mining would be by open pit, and water and power are available at the site.[5]

NONMETALS

Cement.—The French-owned Lafarge cement interests are being Moroccanized under an October 1971 agreement, with the French relinquishing controlling shares. Three Moroccan agencies—Société Nationale d'Investissement, (SNI), Caisse de Dépôt et de Gestion, and Banque Nationale de Développement Économique—will provide new capital for a 50-percent interest in Lafarge-Maroc. The Moroccan Government partners are to invest approximately $4.4 million in Lafarge-Maroc, which will be used to expand the firm's cement plant in Casablanca to 1 million tons per year.

Moroccanization, in this case, meets the Government's criterion of implementation through expansion rather than by merely substituting Moroccan for foreign capital. SNI will also increase its present share in Ciments Artificiels de Meknes to match the 41-percent interest to be retained by the French parent company.[6]

Fertilizer Materials.—The Moroccan 5-year plan for 1968–72 called for the Government's Office Chérifien des Phosphates (OCP) to invest a total of $145 million for modernization and expansion of the phosphate rock industry to a capacity of 18 million metric tons per year. In the Khouribga area, which includes mines at Beni Idir, Sidi Daoui, Oued Zem, and Meraa el-Arich, as well as at Khouribga proper, progress has been made in mechanizing the underground operations, equipping and expanding open pit operations, and installing conveyor belts between centers. A large dragline with a 63-cubic-yard shovel began operations at Sidi Daoui during 1970, and another dragline with a 45-cubic-yard shovel was in use at Meraa el-Arich. Continued expansion of open pit mines is anticipated, and nearly all of the projected growth in the phosphate rock industry is to come from strip mines.

Expansion of treatment facilities was also underway. To facilitate the use of lower grade materials, a calcination plant of 420,000 ton-per-year capacity and an associated dry-enrichment plant, both under construction at Beni Idir, were scheduled for completion early in 1972. In 1971, construction of a 300,000-ton-per-year- capacity washing plant was started at Meraa el-Arich. Another calcination plant, with a capacity of 400,000 tons per year, was scheduled for construction at Youssoufia, and this project will raise low-grade 67-

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[4] U.S. Bureau of Mines. Mineral Trade Notes. V. 68, No. 8, August 1971, p. 14.

Western Miner. Seferif Iron Ore Project in Morocco. V. 44, No. 7, July 1971, p. 98.

World Minerals and Metals. Morocco. Expansion Plans for Iron Ore. No. 4, November–December 1971, p. 26.

[5] Bureau of Mines. Mineral Trade Notes. V. 68, No. 11, November 1971, p. 36.

[6] Bureau of Mines. Mineral Trade Notes. V. 69, No. 2, February 1972, p. 9.

percent ore from a new section at Youssoufia to a grade of 75 percent. Marketing the low-grade ore from this area has been difficult in the past, and future operations will be influenced by the results of the calcination projects.

Operations of the Maroc-Chemie chemical complex at Safi, which produces triple superphosphate and diammonium phosphate, have been unprofitable for some time. Projected extraction of iron oxide and copper from hitherto discarded pyrrhotite cinders might possibly make operations economical. Although pilot plant tests have not yet been made, encouraging results have been obtained from research in this field done for Morocco in West Germany.[7]

The OCP has announced plans to construct a phosphoric acid plant with a capacity of 1,000 tons per day of P_2O_5 equivalent. The plant is to produce phosphoric acid, 54 percent P_2O_5 equivalent, which may be used on site to manufacture ammonium phosphates. The plant is to be located south of Safi and next to the existing Maroc-Chemie fertilizer plant on the coastal area known as Bord de Mer.

Phosphate rock for the new plant will come from the Youssoufia mining area. Present production facilities at Safi include a phosphoric acid plant with a capacity of 150,000 tons per year of P_2O_5 equivalent, two triple superphosphate plants, each with a capacity of 200,000 tons per year, and an attendant sulfuric acid plant with a capacity of 430,000 tons per year. The sulfuric acid plant uses low-grade pyrrhotite from the Maroc-Chemie mine at Kettara. Up to 550,000 tons of phosphate rock from Youssoufia are consumed annually at the Maroc-Chemie fertilizer plants.[8]

Urea was changed from the list of items that may be imported into Morocco without licenses, to the list of items requiring licenses.[9]

Fluorspar.—A fluorspar deposit in Meknes Province, with an estimated reserve of 3 million tons, is to be jointly developed by Ugine Kuhlmann and Omnium-Nord-Africain of France, and Preussag Aktiengesellschaft of West Germany. In a recent agreement signed between the companies and the Moroccan Government, approximately 100,000 tons of ore containing 62 percent CaF_2 are scheduled to be produced annually. A proposed mill will convert the ore into some 50,000 tons of 97-percent CaF_2 concentrate annually, for shipment to West European markets. The decision to go ahead with the project followed extensive drilling in the El Hammon region by the State-owned BRPM.[10]

Salt.—Substantial tonnages of rock salt have been discovered in northern Morocco, seven miles from the Atlantic port of Mohammedia, north of Casablanca. Exploratory drilling was originally aimed at finding potash, but rock salt was found instead, so the objectives of the search had to be changed.

An underground salt basin was delineated some 1,000 feet below the surface. This very high-grade 98 percent NaCl deposit of rock salt averages 250 feet in thickness and covers an area of about 20 square miles. Overall reserves have been initially estimated at about 3 billion tons of salt.

An exploration program, originally expected to last 4 years at a cost of $3.49 million, actually required only $2.65 million, of which the United Nations Development Program funded $1.18 million and the Moroccan Government $1.47 million. Each group has allocated $600,000 to carry out additional work over a 1-year period, during which time a 500-ton sample will be mined for detailed analysis. During the next stage of exploration, a 5-foot-diameter hole is scheduled to be drilled in about 2 months.

Total reserves may eventually turn out to be closer to 15 billion metric tons of salt. Considering the quality and the extensive nature of the deposit, an investment of $10 million may be adequate for the establishment of the first major rock salt mine in Morocco and Africa as a whole. Mining at a rate of about 2 million tons per year is envisaged, and access will be through a three-mile incline into the ore body of salt. At a later date, a vacuum plant to produce 99.999 percent pure salt could be established.[11]

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[7] Page 20 of work cited in footnote 6.

[8] Phosphorus & Potassium (London). New Plants and Projects. No. 55, September–October 1971, p. 11.

[9] U.S. Embassy Rabat, Morocco. State Department Airgram A–20, Feb. 10, 1971, 2 pp.

[10] Page 10 of work cited in footnote 6.

Industrial Minerals. U-K and Preussag Finalise Fluorspar Agreement. No. 49, October 1971, p. 30.

———. Morocco. No. 48, September 1971, p. 26.

[11] Mining Magazine (London). Moroccan Rock Salt Discovery. January 1972, p. 9.

MINERAL FUELS

Petroleum.—Esso Exploration Corp. has temporarily suspended its petroleum operations in offshore Morocco, but two other United States companies, Texas Eastern Marco, Inc., a subsidiary of Eastern Transmission Corp. and Bosco, Petroleum Corp. have signed contracts with the Moroccan Government for new exploration. Texas Eastern will reportedly invest $10 million and Bosco $2.5 million over a period of years. The French company, Société Nationale des Pétroles d'Aquitaine (SNPA), was also prospecting for petroleum as was the Belgian company, Petrofina.[12]

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[12] U.S. Embassy Rabat, Morocco. State Department Airgram A-27, Apr. 5, 1971, p. 6.

The Mineral Industry of The Netherlands

By Frank J. Cservenyak [1]

In 1971 the gross national product (GNP) of the Netherlands increased about 12 percent to $39.1 billion [2] in current prices. Industrial production rose about 6 percent in 1971; however, rising costs, mainly those of labor but also those of capital goods, stagnant demand, and overproduction in many fields severely reduced profits. Average worker productivity increased almost 8 percent whereas average industrial wages increased 10.7 percent. The average unemployment rate in 1971 was 1.7 percent and employment at the end of 1971 was 4,761,000.

Because of reduced world demand for the Netherlands exports, industrial production leveled off in the final quarter of 1971 and brought the year's increase in volume to about 6 percent, a level well under the 1970 increase. Output of the manufacturing sector grew only 3.5 percent, with the help of substantial increases in building materials, chemical and food products, and a moderate increase in metal manufacture but with a relatively poor performance in textiles, clothing, leather, paper, rubber, and petroleum refining. Large increases were noted in natural gas and public utility production.

The average labor cost per worker increased 13.5 percent in 1971, and the Central Plan Bureau predicted a 12-percent rise in 1972. The difference is based mainly on a smaller rise in social premiums and on less overtime, while actual wage increases are expected to be about equal to increases in 1971. Effective January 1, 1972 the Government established a moderate increase in the minimum wage, bringing it to about $57.90 per week. The labor cost per unit of product should rise again roughly 9 percent for the economy as a whole and 5.5 percent for manufactured products. Comparing this with the average 2.5-percent rise in labor cost per unit in other European countries points out the concern for the Netherlands competitiveness. Labor costs for blue collar workers in the Netherlands are the highest in the Common Market except for those in West Germany, and the highest for all workers if white collar employees are included.

Personal consumption expanded by a moderate 3.5 percent in real terms in 1971. The consumer price index rose 7.5 percent in 1971, far more than the 4.4 percent in 1970 and slightly more than the official forecast. The large inflationary factors continue to be rising labor costs, the increased consumer demand which results from higher real wages and persistent budgetary deficits.

Distinct signs of improvement were noted, at least in statistical terms, in the Netherlands balance of payments situation which for the past 2 years has been marked by large deficits on current account and even larger undesired liquidity creating surpluses on capital transactions. With imports slowing significantly due to moderation in consumption and to absolute declines in investment volume, and with exports maintaining a fairly steady rate of growth, the balance of payments on current account moved into surplus for the first time in 2 years in the July–September quarter of 1971. The surplus increased in the last quarter, so that the deficit for the year totaled only about $163 million, one-third of the deficit for 1970.

The concern of the Netherlands public over air, water, and noise pollution continued to increase and there should be a rapidly growing market for U.S. technology and equipment in this area, both for export and for licensing. According to the Economic Ministry, 2 percent of the Netherlands GNP or $1 billion per year will be spent on environmental control by 1982. The Netherlands Government intends to establish a comprehensive water pollution monitoring system on the vast network of rivers and canals. The public, through the municipalities is also exercising control over environmentally offensive industrial activities. Firms planning to build or expand production facilities in the Netherlands must be prepared to meet increasingly strict pollution requirements and are advised to pay attention to all local regulations.[3]

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[1] Physical scientist, Division of Ferrous Metals.

[2] Where necessary, values have been converted from Netherlands guilders (f) to U.S. dollars at the rate of f3.245 = US$1.00.

PRODUCTION

In the minerals industries, significant increases were reported in 1971 in the production of aluminum, lead, and natural gas. A slight decrease was noted in the production of petroleum products and significant decreases were shown for tin, and zinc production.

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[3] U.S. Embassy, The Hague, Netherlands. State Department Dispatch A–136, Apr. 28, 1972.

Table 1.—Netherlands: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1969	1970	1971 [p]
METALS			
Aluminum, metal, primary	72,144	75,148	116,387
Cadmium, metal [e]	140	[r] 120	120
Iron and steel:			
Sintered ore (from imported ore) thousand tons	3,387	3,191	3,289
Pig iron, including blast furnace ferroalloys do	3,459	3,594	3,760
Crude steel do	[r] 4,721	5,042	5,083
Semimanufactures do	[r] 3,733	4,006	4,429
Lead, metal, primary	14,794	17,613	23,743
Tin, metal, primary long tons	5,298	5,937	824
Zinc, metal, primary	46,627	46,223	41,400
NONMETALS			
Cement thousand tons	3,296	3,830	4,045
Fertilizer materials, manufactured:			
Nitrogenous, nitrogen content do	878	809	991
Phosphatic, phosphorus pentoxide content do	250	249	280
Salt, all types do	2,669	2,869	3,167
Sand, industrial do	NA	21,559	4,200
Sulfur:			
Elemental, byproduct	31,000	33,200	34,000
Sulfuric acid (100 percent H_2SO_4) thousand tons	557	587	559
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	81,400	86,000	92,500
Coal, anthracite and bituminous thousand tons	5,554	4,334	3,610
Coke:			
Coke oven do	2,030	1,997	1,901
Gashouse do	3	--	--
Fuel briquets, all grades do	1,047	886	585
Gas:			
Manufactured, all types million cubic feet	[2] 73,588	[2] 72,293	NA
Natural:			
Gross production do	773,176	1,118,304	1,546,740
Marketable do	762,687	1,107,427	1,536,499
Peat [e] thousand tons	400	400	400
Petroleum:			
Crude oil thousand 42-gallon barrels	13,792	13,080	11,683
Refinery products:			
Aviation gasoline do	1,682	1,967	2,011
Motor gasoline do	34,833	39,228	41,081
Jet fuel do	14,104	16,440	17,544
Kerosine do	8,448	9,300	9,602
Distillate fuel oil do	101,366	127,827	126,246
Residual fuel oil do	142,178	169,430	157,016
Lubricants do	314	3,297	3,906
Bitumen do	3,951	4,818	5,618
Liquefied petroleum gas do	7,180	8,166	9,106
Other do	38,507	47,202	50,727
Refinery fuel and losses do	32,596	35,571	31,642
Total	385,159	463,246	454,499

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, the Netherlands presumably produces a variety of crude construction materials such as clays, stone, sand and gravel but no data are published.

[2] Coke oven and blast furnace gas only.

TRADE

Total exports in 1971 were about 97 percent of imports. During 1971 total exports of about $14.2 billion were up almost 15 percent, while imports increased by 11.5 percent to about $14.7 billion.

Table 2.—Netherlands: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum:			
Bauxite	987	4,234	West Germany 2,280; Belgium-Luxembourg 838.
Oxide and hydroxide	5,871	11,593	Japan 3,304; West Germany 2,357; Italy 2,020.
Metal, including alloys:			
Scrap	16,811	14,382	West Germany 10,314; Belgium-Luxembourg 2,679; France 936.
Unwrought	64,067	64,053	West Germany 24,265; Belgium-Luxembourg 21,430; Italy 11,354.
Semimanufactures	37,363	40,109	West Germany 18,622; Belgium-Luxembourg 5,754; France 4,160.
Bismuth, including alloys, all forms	86	94	West Germany 32; France 25; Italy 14.
Cadmium, including alloys, all forms	194	167	Belgium-Luxembourg 80; France 39; West Germany 33.
Chromium:			
Chromite	2,596	4,231	Italy 1,538; France 983; United Kingdom 652.
Oxide and hydroxides	634	198	Italy 82; West Germany 65; France 21.
Cobalt:			
Oxide and hydroxide	4	41	United Kingdom 25; North Korea 12.
Metal, including alloys, all forms	67	7	United States 3.
Columbium and tantalum:			
Tantalum, including alloys, all forms	2	8	West Germany 7; France 1.
Copper, metal, including alloys:			
Scrap	34,187	31,316	West Germany 17,705; Belgium-Luxembourg 11,861; Italy 552.
Unwrought	[r] 9,271	8,275	West Germany 5,632; France 803; Italy 609.
Semimanufactures	20,019	16,919	West Germany 6,116; Belgium-Luxembourg 2,339; United States 2,190.
Gold [1] thousand troy ounces	1,664	3,690	West Germany 2,701; Belgium-Luxembourg 781; France 198.
Iron and steel:			
Ore and concentrate, except roasted pyrite thousand tons	8	92	West Germany 88; Belgium-Luxembourg 3.
Roasted pyrite do	79	87	All to West Germany.
Metal:			
Scrap do	[r] 687	816	West Germany 647; Belgium-Luxembourg 129; France 12.
Pig iron and ferroalloys [2] do	[r] 124	11	United Kingdom 3; West Germany 3; Italy 1; France 1.
Steel, primary forms do	1,018	1,028	Belgium-Luxembourg 261; France 207; Italy 128.
Semimanufactures:			
Bars, rods, angles, shapes, sections do	399	465	West Germany 182; United Kingdom 68; Belgium-Luxembourg 51.
Universal, plates and sheet do	1,278	1,220	West Germany 267; United States 243; United Kingdom 165.
Hoop and strip do	121	133	West Germany 97; Norway 9; Belgium-Luxembourg 6; Italy 4.
Rails and accessories do	37	31	West Germany 16; Italy 10; Belgium-Luxembourg 3.
Wire do	29	33	West Germany 12; France 6; Italy 4.
Tubes, pipes, and fittings do	354	238	Nigeria 57; West Germany 56; Belgium-Luxembourg 52; France 17.
Castings and forgings do	6	7	Belgium-Luxembourg 5; West Germany 2.
Lead:			
Oxides	3,055	2,655	Belgium-Luxembourg 1,824; Czechoslovakia 420; Indonesia 105.
Metal:			
Scrap	8,619	9,388	Belgium-Luxembourg 5,768; West Germany 2,918.
Unwrought	14,601	16,147	West Germany 12,195; Belgium-Luxembourg 1,463.
Semimanufactures	1,333	1,526	Norway 479; United Kingdom 124.
Magnesium, including alloys, all forms	620	421	United Kingdom 135; West Germany 124; United States 94.

See footnotes at end of table.

Table 2.—Netherlands: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS—Continued			
Manganese:			
Ore and concentrate	25,082	34,255	West Germany 7,576; Italy 5,296; France 4,310.
Oxide	4,496	1,664	Cuba 329; Iran 198; India 198.
Mercury 76-pound flasks	290	232	West Germany 87; Philippines 58; Belgium-Luxembourg 29.
Molybdenum, including alloys, all forms	[r] 114	339	West Germany 56; France 22; United Kingdom 17.
Nickel:			
Oxide and hydroxide	783	759	Italy 435; France 132; Belgium-Luxembourg 38.
Metal including alloys:			
Scrap	2,054	1,882	West Germany 897; Belgium-Luxembourg 289; United Kingdom 266.
Unwrought and semimanufactures	2,074	5,254	Sweden 2,806; West Germany 583; Italy 445; People's Republic of China 323.
Platinum-group metals, all forms troy ounces	18,229	13,150	Hong Kong 170; West Germany 37; Iran 30.
Silver, metal, including alloys, all forms thousand troy ounces	4,451	6,377	Belgium-Luxembourg 2,189; West Germany 2,147; Czechoslovakia 799.
Tellurium, elemental, and arsenic	4	5	France 4; Spain 1.
Tin:			
Ore and concentrate long tons	--	994	All to West Germany.
Metal, including alloys:			
Scrap do	451	1,176	United Kingdom 854; West Germany 233; Denmark 76.
Unwrought do	7,272	5,642	West Germany 3,807; France 492; Austria 359.
Semimanufactures do	359	422	Belgium-Luxembourg 199; Norway 56; West Germany 46.
Titanium, dioxide	21,530	20,284	West Germany 4,996; Italy 4,378; France 2,453.
Tungsten:			
Ore and concentrate	121	120	United Kingdom 89; Japan 27.
Metal, including alloys, all forms	222	258	West Germany 132; Austria 38; United Kingdom 32.
Zinc:			
Ore and concentrate	22,756	16,169	Belgium-Luxembourg 10,729; France 5,440.
Oxide	11,245	10,376	Belgium-Luxembourg 1,690; Italy 1,506; West Germany 1,081.
Metal, including alloys:			
Scrap	7,430	6,243	France 4,864; West Germany 940; Belgium-Luxembourg 420.
Dust (blue powder)	65	287	West Germany 148; United Kingdom 90; Israel 37.
Unwrought	30,181	26,272	West Germany 16,210; France 5,220; Denmark 2,497.
Semimanufactures	939	970	Turkey 275; West Germany 228.
Other:			
Ore and concentrate	12,504	205	West Germany 152; France 50.
Ash and residues containing nonferrous metals:			
Aluminum	--	3,903	West Germany 3,761; Italy 142.
Iron and steel thousand tons	132	133	Belgium-Luxembourg 90; West Germany 43.
Lead	4,395	5,578	Belgium-Luxembourg 5,226; East Germany 172; West Germany 168.
Zinc	5,617	6,561	Belgium-Luxembourg 3,095; West Germany 2,238; France 971.
Other	10,868	5,306	United Kingdom 2,952; West Germany 1,977; Belgium-Luxembourg 259.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum	5,613	5,607	West Germany 711; France 559; Belgium-Luxembourg 267.
Dust and powder of precious and semiprecious stones, including diamond thousand carats	1,640	2,571	West Germany 897; France 368; United Kingdom 316; Italy 212.
Grinding and polishing stones	1,198	1,508	West Germany 587; United Kingdom 239; France 165; Belgium-Luxembourg 143.
Asbestos	162	275	Belgium-Luxembourg 173; West Germany 70.
Borates, crude natural	273,756	308,325	West Germany 100,849; United Kingdom 56,910; France 52,045; Belgium-Luxembourg 28,069.

See footnotes at end of table.

Table 2.—Netherlands: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
NONMETALS—Continued			
Cement	58,414	112,879	West Germany 93,847; Belgium-Luxembourg 11,494; Ireland 4,729.
Chalk	40,842	34,955	Belgium-Luxembourg 34,368; West Germany 322.
Clays and products:			
Crude clays:			
Bentonite	2,915	4,842	France 2,920; Belgium-Luxembourg 1,410; Italy 206.
Kaolin	38,153	45,680	Belgium-Luxembourg 45,180; West Germany 292.
Refractory	4,052	5,888	West Germany 2,198; Belgium-Luxembourg 1,373; Sweden 838.
Other thousand tons	102	110	West Germany 72; Belgium-Luxembourg 36.
Products:			
Refractory including nonclay bricks	12,464	24,183	West Germany 7,931; United Kingdom 7,208; Belgium-Luxembourg 2,223.
Nonrefractory thousand tons	612	557	West Germany 431; Belgium-Luxembourg 102.
Diamond, not set or strung, except dust and powder thousand carats	1,332	1,410	NA.
Diatomite and other infusorial earths	254	442	Indonesia 253; West Germany 147.
Feldspar and leucite	120	184	Belgium-Luxembourg 151; Indonesia 17.
Fertilizer materials:			
Crude:			
Nitrogenous	542	16	NA.
Phosphatic	7,191	6,379	West Germany 3,893; France 2,467.
Potassic salts	20	--	
Other	43,296	47,011	Belgium-Luxembourg 33,484; West Germany 10,262.
Manufactured:			
Nitrogenous thousand tons	855	841	China, People's Republic of 182; India 97; United Kingdom 53; West Germany 43.
Phosphatic:			
Thomas slag	[r] 185	156	NA.
Other thousand tons	283	246	France 162; West Germany 10.
Potassic	[r] 887	302	Congo (Brazzaville) 104.
Other, including mixed thousand tons	786	596	France 192; Belgium-Luxembourg 21.
Ammonia, anhydrous	196,133	371,289	West Germany 159,448; Belgium-Luxembourg 93,929; United Kingdom 45,904.
Fluorspar	42	41	Belgium-Luxembourg 16.
Lime	2,462	3,204	West Germany 1,468; Belgium-Luxembourg 1,355.
Magnesite	19,548	22,469	West Germany 9,035; France 1,902; Belgium-Luxembourg 951.
Mica	93	92	Belgium-Luxembourg 43.
Pigments, mineral, including processed iron oxides	649	867	Yugoslavia 131; Indonesia 107; United Kingdom 106.
Precious and semiprecious stones, except diamond kilograms	20,102	13,743	West Germany 5,840; France 4,090; United States 1,070.
Salt thousand tons	1,629	2,065	Belgium-Luxembourg 928; Sweden 465; West Germany 275.
Stone, sand and gravel:			
Dimension stone:			
Unworked and partly worked	3,064	7,729	Belgium-Luxembourg 6,038; West Germany 1,092.
Worked	2,708	1,777	Belgium-Luxembourg 939; West Germany 646.
Gravel and crushed stone thousand tons	3,158	3,618	Belgium-Luxembourg 3,328; West Germany 283.
Quartz and quartzite	3,930	4,674	Belgium-Luxembourg 2,451; West Germany 1,755; Sweden 138.
Sand, excluding metal-bearing thousand tons	8,168	8,077	Belgium-Luxembourg 7,620; West Germany 206; France 111.
Sulfur:			
Elemental, all forms	1,417	927	West Germany 788; Belgium-Luxembourg 111.
Sulfur dioxide	1,018	1,016	Belgium-Luxembourg 90.
Sulfuric acid, oleum thousand tons	108	145	Belgium-Luxembourg 84; West Germany 19; France 6.
Talc and steatite	427	398	West Germany 187; Venezuela 80.
Other nonmetals, n.e.s. thousand tons	219	234	Belgium-Luxembourg 122; West Germany 71; France 34.

See footnotes at end of table.

Table 2.—Netherlands: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	7	33	Belgium-Luxembourg 32.
Carbon black	75,260	76,603	France 28,081; West Germany 13,876; Sweden 7,338.
Coal and briquets:			
Anthracite and bituminous coal thousand tons	1,792	1,647	Belgium-Luxembourg 791; France 501; West Germany 281; Switzerland 16.
Briquets of anthracite and bituminous coal do	836	689	West Germany 257; Belgium-Luxembourg 253; France 135.
Lignite briquets	299	225	Belgium-Luxembourg 25.
Coke and semicoke thousand tons	789	691	Belgium-Luxembourg 249; France 168; Algeria 135.
Gas, hydrocarbon:			
Natural, including liquefied petroleum gas do	451	565	Belgium-Luxembourg 243; West Germany 90; Spain 66.
Hydrogen, helium, and rare gases	545	640	Belgium-Luxembourg 367; Denmark 117; West Germany 91.
Petroleum:[3]			
Crude thousand 42-gallon barrels	7,743	52,640	West Germany 25,751; Belgium-Luxembourg 12,321; United Kingdom 6,704.
Refinery products:			
Gasoline do	41,863	50,643	West Germany 25,755; United Kingdom 12,622; Belgium-Luxembourg 3,149.
Kerosine and jet fuel do	8,556	12,152	United Kingdom 3,616; West Germany 2,794; Denmark 1,277.
Distillate fuel oils do	54,861	88,520	West Germany 57,367; Belgium-Luxembourg 7,654; Sweden 5,361.
Residual fuel oils do	89,104	124,089	United Kingdom 24,049; West Germany 13,460; United States 13,193; Belgium-Luxembourg 9,510.
Lubricants do	3,436	3,339	United Kingdom 654; Belgium-Luxembourg 511; Sweden 314; West Germany 286.
Mineral jelly and wax do	589	521	United Kingdom 251; West Germany 209; France 27; Italy 20.
Bituminous mixtures do	199	254	West Germany 85; Belgium-Luxembourg 84; Guinea 24; Norway 11.
Other do	1,617	1,401	West Germany 548; Denmark 175; Sweden 119; Norway 113.
Mineral tar and coal-, petroleum-, or gas-derived crude chemicals thousand tons	250	213	Belgium-Luxembourg 55; West Germany 55; United States 21; United Kingdom 19; Spain 13.

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[r] Revised. NA Not available.

[1] Excluding gold coin and gold and alloys shipped by post.

[2] Including sponge iron, shot grit, pellets, powder, spiegeleisen and ferromanganese.

[3] Includes bunkers.

Sources: Commodity Trade Statistics, 1969, v. XIX, and 1970, v. XX; Maandstatistiek Van de Buitenlandse Handel per Goederensoort, December 1969, December 1970.

Table 3.—Netherlands: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum:			
Bauxite	107,608	83,825	Greece 77,161; Guyana 6,170.
Alumina	158,420	188,218	Surinam 161,909; West Germany 15,406; France 10,536.
Metal, including alloys:			
Scrap	9,612	10,897	West Germany 3,681; Belgium-Luxembourg 2,423; East Germany 1,859.
Unwrought, including alloys	43,324	45,356	West Germany 5,655; France 3,934; Canada 1,271.
Semimanufactures	51,180	51,343	West Germany 20,595; Belgium-Luxembourg 19,606; France 4,560.
Antimony:			
Ore and concentrate	5	--	
Metal, including alloys, all forms	122	159	Belgium-Luxembourg 131; Czechoslovakia 16.
Arsenic, oxides and acids	1,040	839	Belgium-Luxembourg 669; France 144; United Kingdom 20.
Bismuth, including alloys, all forms	179	341	Belgium-Luxembourg 80; Peru 72; West Germany 58; United Kingdom 47.

See footnotes at end of table.

Table 3.—Netherlands: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS—Continued			
Cadmium, including alloys, all forms	123	147	West Germany 68; Belgium-Luxembourg 55.
Chromium:			
Chromite	4,134	5,600	Mozambique 2,401; Republic of South Africa 1,970; Finland 990.
Oxide and hydroxide	1,492	994	West Germany 545; U.S.S.R. 295; France 79.
Metal, including alloys, all forms	30	43	United Kingdom 16; France 13; West Germany 6.
Cobalt:			
Oxides and hydroxides	404	321	Belgium-Luxembourg 254; France 64.
Metal, including alloys, all forms	243	372	United Kingdom 123; Belgium-Luxembourg 107; United States 106.
Columbium and tantalum, tantalum	7	7	United States 5; Austria 1; Belgium-Luxembourg 1.
Copper, metal including alloys:			
Scrap	7,428	9,579	Belgium-Luxembourg 3,297; West Germany 2,179; East Germany 1,982.
Unwrought	44,197	43,586	Belgium-Luxembourg 13,611; Chile 9,964; Zambia 5,749; United Kingdom 4,338.
Semimanufactures	68,819	71,312	Belgium-Luxembourg 44,179; West Germany 17,728; France 4,535.
Gold [1] thousand troy ounces	855	76	Denmark 72; West Germany 3; Belgium-Luxembourg 1.
Iron and steel:			
Ore and concentrate, except roasted pyrite thousand tons	4,962	5,416	Sierra Leone 693; Sweden 609; Norway 453; Brazil 299.
Metal:			
Scrap do	317	298	Belgium-Luxembourg 231; West Germany 44; United Kingdom 11.
Pig iron [2] do	48	133	West Germany 64; Finland 40; United Kingdom 11.
Ferroalloys do	50	53	Norway 23; France 10; West Germany 7; United States 5.
Steel, primary forms do	274	285	France 108; Norway 80; Belgium-Luxembourg 61.
Semimanufactures:			
Bars, rods, sections do	1,317	1,356	Belgium-Luxembourg 708; West Germany 444; France 129.
Universal plates and sheets do	792	810	Belgium-Luxembourg 358; West Germany 333; France 58.
Hoop and strip do	256	232	West Germany 123; Belgium-Luxembourg 82; France 21.
Rails and accessories do	44	52	West Germany 27; Belgium-Luxembourg 13; France 13.
Wire do	86	88	Belgium-Luxembourg 52; West Germany 29; France 2; United Kingdom 2.
Tubes, pipes, and fittings do	617	678	West Germany 401; France 130; Belgium-Luxembourg 54; United Kingdom 39.
Castings and forgings do	8	12	West Germany 6; Belgium-Luxembourg 4.
Lead:			
Ore and concentrate	7	5	NA.
Oxides	12,672	13,927	Belgium-Luxembourg 4,985; Mexico 3,762; West Germany 2,581; France 2,486.
Metals, including alloys:			
Scrap	2,384	3,938	West Germany 1,810; Belgium-Luxembourg 1,281.
Unwrought	61,219	62,272	United Kingdom 21,659; Belgium-Luxembourg 14,920; Australia 10,766.
Semimanufactures	6,470	2,503	Belgium-Luxembourg 1,835; United States 258; West Germany 255.
Magnesium, metal including alloys:			
Scrap	304	191	NA.
Unwrought	527	577	United States 251; France 100; U.S.S.R. 91; Norway 53.
Semimanufactures	70	121	United States 45; West Germany 26; United Kingdom 21; Switzerland 15.
Manganese:			
Ore and concentrate	57,922	111,398	U.S.S.R. 6,483; France 501; West Germany 265.
Oxide	848	2,584	Belgium-Luxembourg 2,276; Japan 260.
Mercury 76-pound flasks	2,002	1,799	United States 638; Spain 290; Belgium-Luxembourg 203; Turkey 203.

See footnotes at end of table.

Table 3.—Netherlands: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS—Continued			
Molybdenum, including alloys, all forms	26	73	West Germany 40.
Nickel:			
Matte, speiss and similar materials	277	359	Cuba 284; United Kingdom 63.
Metal, including alloys:			
Scrap	1,491	2,582	United States 717; West Germany 407; France 396; Czechoslovakia 237.
Unwrought	1,807	3,520	Norway 669; United Kingdom 662; U.S.S.R. 631; France 443; Mozambique 333.
Semimanufactures	3,811	4,718	West Germany 1,544; Sweden 1,265; United Kingdom 615; Canada 422.
Platinum-group metals, all forms thousand troy ounces	52	78	West Germany 28; France 19; United Kingdom 9; U.S.S.R. 4.
Silver metal, including alloys, all forms do	8,472	6,520	West Germany 1,949; United Kingdom 1,609; France 1,193; Belgium-Luxembourg 536.
Tellurium, elemental and arsenic	14	15	Belgium-Luxembourg 7; U.S.S.R. 4.
Tin:			
Ore and concentrate long tons	10,378	9,997	Chile 3,105; Australia 2,538; Democratic Republic of Congo 1,800.
Oxide do	85	72	Belgium-Luxembourg 54; West Germany 15.
Metal, including alloys:			
Scrap do	311	291	Belgium-Luxembourg 184; West Germany 100.
Unwrought do	6,473	5,273	Thailand 2,468; United Kingdom 780; People's Republic of China 672; Indonesia 515.
Semimanufactures do	82	137	West Germany 114.
Titanium:			
Ore and concentrate	571	159	Australia 157.
Dioxide	5,616	5,958	West Germany 3,846; Italy 667; Belgium-Luxembourg 605.
Tungsten:			
Ore and concentrate	373	378	Portugal 213; United Kingdom 123; United States 27.
Metal, including alloys, all forms	12	104	West Germany 45; United States 26; United Kingdom 9.
Zinc:			
Ore and concentrate	102,152	90,366	Canada 44,625; Sweden 10,639; Ireland 7,790.
Oxides	2,689	3,391	West Germany 1,286; Belgium-Luxembourg 627; France 461.
Metal, including alloys:			
Scrap	1,609	1,814	West Germany 1,147.
Dust (blue powder)	3,129	2,824	West Germany 1,701; Belgium-Luxembourg 681; United Kingdom 320.
Unwrought	18,027	15,964	West Germany 3,298; North Korea 2,974; Bulgaria 2,731.
Semimanufactures	4,658	5,150	Belgium-Luxembourg 2,785; West Germany 1,542; France 671.
Other:			
Ores and concentrates:			
Columbium, molybdenum, tantalum, vanadium and zirconium	13,994	18,827	United States 18,776; Belgium-Luxembourg 40.
Not specified	1,166	1,135	South Africa, Republic of 473; Bolivia 154; Burma 137.
Ash and residues containing nonferrous metals:			
Lead	1,744	3,793	West Germany 1,064; Algeria 843; Norway 750.
Tin long tons	--	452	East Germany 342.
Zinc	40,143	40,717	West Germany 20,987; United Kingdom 6,983; Belgium-Luxembourg 3,446.
Other	49,682	76,003	Canada 56,152; U.S.S.R. 14,651; West Germany 2,420.
Metals, including alloys, all forms:			
Metalloids:			
Phosphorus	42	145	West Germany 123; Sweden 12.
Selenium	6	8	United States 4; Belgium-Luxembourg 2.
Silicon	719	879	France 673; Italy 100; Norway 26.
Alkali, alkaline earth and rare-earth metals	206	369	West Germany 223; France 146.
Oxides of barium, strontium and magnesium	803	931	United States 329; West Germany 216; United Kingdom 185.

Table 3.—Netherlands: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum etc. thousand tons	382	376	West Germany 365; Turkey 7.
Dust and powder of precious and semiprecious stones thousand carats	1,528	2,410	Ireland 2,076; United Kingdom 261.
Grinding and polishing stones	1,950	2,218	West Germany 1,182; Austria 263; United Kingdom 207.
Asbestos	20,653	22,063	Canada 14,576; Italy 2,952; U.S.S.R. 2,107.
Barite and witherite	34,569	26,584	West Germany 23,302; Ireland 2,562.
Boron materials:			
Crude natural borates	310,018	307,327	United States 291,996; Turkey 15,040.
Oxide and acid	1,808	1,863	United States 1,020; Turkey 510; France 310.
Cement thousand tons	2,182	2,219	West Germany 1,219; Belgium-Luxembourg 965.
Chalk	138,319	143,881	Belgium-Luxembourg 79,439; France 46,195; West Germany 14,363.
Clays and products:			
Crude clays:			
Bentonite thousand tons	14	24	West Germany 11; United States 10.
Kaolin do	193	229	United Kingdom 166; United States 22; Czechoslovakia 15.
Refractory do	132	179	West Germany 143; France 11; Czechoslovakia 9.
Other do	509	436	West Germany 404; United Kingdom 19.
Products:			
Refractory, including nonclay bricks do	82	100	West Germany 32; United Kingdom 27; France 10.
Nonrefractory do	206	218	West Germany 105; Belgium-Luxembourg 85; Italy 15.
Cryolite and chiolite	747	914	All from Denmark.
Diamond, all grades:			
Gem, not set or strung thousand carats	1,455	1,805	NA.
Industrial thousand kilograms	292	159	Brazil 152.
Diatomite and other infusorial earths	10,699	8,869	Denmark 3,624; Spain 1,343; France 1,337.
Feldspar and leucite	32,874	29,866	Norway 14,021; Belgium-Luxembourg 8,307; Italy 2,805.
Fertilizer materials:			
Crude:			
Nitrogenous	30,215	26,063	Chile 26,026.
Phosphatic thousand tons	1,237	1,583	United States 496; Morocco 437; Togo 383; Senegal 204.
Potassic salts do	41	42	West Germany 21; France 19.
Other do	36	37	West Germany 30; Belgium-Luxembourg 7.
Manufactured:			
Nitrogenous do	15	52	Belgium-Luxembourg 49.
Phosphatic:			
Thomas slag (P_2O_5 content) do	21	19	Belgium-Luxembourg 17; West Germany 2.
Other (P_2O_5 content) do	29	19	United States 14; Belgium-Luxembourg 2.
Potassic do	424	415	West Germany 189; East Germany 55; France 51.
Other, including mixed do	32	52	Belgium-Luxembourg 22; United Kingdom 11; France 8.
Ammonia, anhydrous	203,571	31,795	United States 21,101; Trinidad 9,854.
Fluorspar	27,996	35,559	France 2,263; West Germany 167.
Graphite, natural	450	311	West Germany 118; United Kingdom 97; Austria 55.
Gypsum and plasters thousand tons	253	270	France 156; West Germany 102.
Lime do	846	933	West Germany 463; Belgium-Luxembourg 449.
Magnesite	38,930	39,626	Greece 14,264; India 6,975; Austria 4,543.
Mica:			
Crude, including splittings and waste	1,090	1,321	United Kingdom 587; Norway 267; United States 163; India 121.
Worked, including agglomerated splittings	65	66	Switzerland 31.
Pigments, mineral:			
Natural, crude	2,804	1,887	West Germany 1,283; Austria 315; United States 106.
Iron oxides, processed	12,552	13,390	West Germany 9,838; France 1,969.
Precious and semiprecious stones, except diamond kilograms	295,367	162,959	Brazil 152,172; West Germany 3,315.
Pyrite thousand tons	97	111	Cyprus 102.

See footnote at end of table.

Table 3.—Netherlands: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
NONMETALS—Continued			
Salt	63,449	416,619	West Germany 156,499; France 134,682; Italy 121,098.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	r 32,888	37,876	West Germany 18,635; Belgium-Luxembourg 7,723; France 7,620.
Caustic potash	r 3,562	4,224	France 1,759; Belgium-Luxembourg 1,588; West Germany 424.
Stone, sand and gravel:			
Dimension stone:			
Unworked and partly worked thousand tons	2,385	2,592	Belgium-Luxembourg 1,562; Sweden 506; West Germany 472.
Worked	32,505	33,518	Italy 15,066; West Germany 5,818; Belgium-Luxembourg 4,930.
Dolomite thousand tons	686	740	Belgium-Luxembourg 623; West Germany 84; United Kingdom 19.
Gravel and crushed rock do	13,817	14,857	West Germany 9,880; Belgium-Luxembourg 1,775; United Kingdom 2,327.
Limestone do	949	1,103	Belgium-Luxembourg 1,084; West Germany 14.
Quartz and quartzite	53,129	25,339	Belgium-Luxembourg 9,853; Norway 9,753; West Germany 3,422.
Sand, excluding metal bearing thousand tons	7,351	7,566	West Germany 7,039; Belgium-Luxembourg 466.
Sulfur:			
Elemental do	389	416	United States 298; France 104; Poland 10.
Sulfur dioxide	1,365	1,845	West Germany 1,776; France 69.
Sulfuric acid, oleum	25,487	42,814	Belgium-Luxembourg 18,132; France 15,263; West Germany 9,381.
Talc and steatite	14,960	18,839	Norway 4,964; Austria 4,870; People's Republic of China 3,184.
Other nonmetals, n.e.s. thousand tons	2,289	2,977	West Germany 1,710; Belgium-Luxembourg 1,197.
Slag dross and similar waste, not metal-bearing:			
From iron and steel manufacture do	3,255	3,416	West Germany 1,891; Belgium-Luxembourg 1,524.
Slag and ash, n.e.s do	495	574	West Germany 339; Belgium-Luxembourg 232.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	1,286	1,863	West Germany 1,166; United States 288.
Carbon black (including gas carbon)	15,966	15,045	West Germany 10,443.
Coal and briquets:			
Anthracite and bituminous coal thousand tons	5,930	4,773	West Germany 1,828; United States 1,292; Poland 462.
Briquets of anthracite and bituminous coal do	12	4	NA.
Lignite and lignite briquets do	63	49	All from West Germany.
Coke and semicoke do	1,003	915	West Germany 720; France 65; United States 51.
Gas, hydrocarbon: Natural including liquefied petroleum gas do	134	96	West Germany 77; Belgium-Luxembourg 14.
Peat do	123	148	Mainly from West Germany.
Petroleum:[3]			
Crude thousand 42-gallon barrels	329,649	456,696	Kuwait 95,260; Libya 89,344; Saudi Arabia 74,854.
Refinery products:			
Gasoline do	8,130	13,388	U.S.S.R. 4,267; Belgium-Luxembourg 2,107; Italy 1,934; France 1,232.
Kerosine and jet fuel do	4,101	3,531	Italy 1,383; Belgium-Luxembourg 980; United Kingdom 350.
Distillate fuel oil do	13,085	21,067	United Kingdom 5,906; Italy 5,689; Bahrain 2,340.
Residual fuel oil do	10,842	14,819	West Germany 3,945; Bahrain 2,515; Brazil 1,825; Belgium-Luxembourg 1,091.
Lubricants do	2,883	3,121	Netherlands Antilles 1,659; United Kingdom 399; Belgium-Luxembourg 308.
Mineral jelly and wax do	164	171	West Germany 76; France 32; United States 23.
Bituminous mixtures do	64	53	Belgium-Luxembourg 25; West Germany 19; United Kingdom 4.
Other do	4,223	4,590	United States 2,129; Belgium-Luxembourg 1,147; West Germany 670.

See footnotes at end of table.

Table 3.—Netherlands: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
MINERAL FUELS AND RELATED MATERIALS—Continued			
Mineral tar and coal–, petroleum–, or gas–derived crude chemicals thousand tons	217	169	Belgium-Luxembourg 35; United States 31; West Germany 26; Netherlands Antilles 25.

r Revised. NA Not available.

[1] Excluding gold coin and gold and alloys shipped by post.

[2] Including spiegeleisen, sponge iron, shot, grit and pellets.

[3] Includes bunkers.

Sources: United Nations Commodity Trade Statistics, Ser. D, v. XIX and XX, 1969, 1970; Maandstatistiek Van de Buitenlandse Handel per Goederensoort, December 1969 and December 1970.

COMMODITY REVIEW

METALS

Aluminum.—Since mid-1970 the market for virgin aluminum has been characterized by a steep increase in supply and a lower than anticipated rate of consumption with a resultant steady decline in prices, erosion of profit margins, and growing stocks. The buildup of Holland Aluminum N.V. and its subsidiaries into a fully integrated unit covering raw materials and semimanufactured and finished products is continuing. In the interest of maintaining raw material supplies, Holland Aluminum is participating in a number of bauxite projects. These include the Kimberley project in Western Australia which may provide Holland Aluminum with as much as 100,000 tons of alumina annually after 1974 and the Aurukan exploration project in Queensland, Australia, in which Péchiney Ugine Kuhlmann has become a partner by exercising its option to acquire a 20-percent share. The capacity of the electrolyzing plant at Aluminum Delfzijl N.V. was increased in 1971 to 96,000 tons annually.

Uranium.—A spectacular rise in the output of nuclear energy is envisaged before the turn of the century. By the year 2000 the Netherlands nuclear production capacity may increase to between 30,000 and 40,000 megawatts, which will be equivalent to one-half of the estimated installed electric capacity. The Netherlands total installed electric capacity in 1970 was 9,000 megawatts, of which only 54 megawatts was supplied by nuclear energy and the remainder by natural gas, oil, and coal. By 1980 electricity production will be more than doubled to 19,000 megawatts with the nuclear energy share of 2,000 megawatts. By 2000, total capacity is estimated to have increased to between 60,000 and 80,000 megawatts, half of which is expected to be supplied by nuclear power stations. The increase in the nuclear production capacity will primarily take place by means of light-water reactors until the 1980's. Subsequently, it is expected to grow by means of fast mercury reactors and possibly also by means of high-temperature gas-cooled reactors. The accuracy of these forecasts is partly dependent on the extent that nuclear powerplants will be able to compete with conventional powerplants. In regard to safety and environmental control, the natural gas-fueled stations and the nuclear powerplants are practically identical. The choice will primarily have to be made on economic grounds.[4]

NONMETALS

Cement.—Cement consumption in the Netherlands in 1971 totaled 5.9 million tons, an increase of 2.3 percent over that of 1970. The cement industry achieved a new output record of 4 million tons in 1971. Of this, 1.2 million tons was produced by Cement-Fabriek Ijmuiden (Cemij) N.V., which celebrated the 40th anniversary of its establishment, and 0.4 millions tons was produced by Cement Fabriek Rozenburg N.V. (Robur). Robur's second cement kiln started operations in 1971. Blast furnace cement accounted for almost one-half of the total quantity of cement used in the Netherlands.

Chemicals.—The year 1971 was marked by a slackening demand for chemicals in the Netherlands, resulting from a general stagnation in economic activity and an increase in production capacity growing out of investments in fixed assets committed in previous years.

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[4] U.S. Embassy, The Hague, Netherlands. State Department Dispatch A–151, May 19, 1972.

A variety of new chemical facilities was brought into production in 1971 on the basis of investments contracted in previous years. Notable among these were new ethylene plants of Gulf and the Netherlands State Mines, a new ammonia plant of the latter, plastics and inorganics by Akzo, Dow's ethylene oxide, ammonia and phosphoric acid by Mekog-Albatros, and several large organics facilities of Shell Chemie. An Oxirane propylene oxide plant was nearing completion at yearend.

Because of a sluggish demand, however, resulting from recession conditions at home and international economic conditions, production of chemicals fell considerably short of expectations. Chemical sales in 1971 climbed to an estimated $2.9 billion, a little more than 9 percent above 1970 sales, and thus maintained a 10.5-percent share of all industrial production in the Netherlands. Corrected figures, however, show that chemical sales per capita in the Netherlands were well under the previously reported US$190 in 1969 and 1970. Meanwhile West Germany moved ahead with the United States and Switzerland and left the Netherlands in fourth place. The chemical production volume index for 1971 came to 311, only 8 percent above that of 1970. There was an estimated net increase of 1,000 in chemical industry employment during the year, taking into account the manning of new facilities coming onstream and some retrenchments because of slackened demand.

Except for paints and coloring materials, which were stagnant, most major categories of chemical products showed moderate gains during the year. Fertilizers and plastics and resins led with a 10-percent growth. Other semifinished products, pharmaceuticals and pesticides, and cleaning materials and cosmetics showed less growth, and other finished products gained only 3 percent.[5]

MINERAL FUELS

Petroleum and Natural Gas.—Oil refinery production, as well as exports, showed a decline in 1971. Imports of crude oil into the Netherlands at 60 million tons remained almost unchanged from the previous year. The Netherlands refineries processed 59.7 million tons of crude oil in 1971 which was 2.5 million tons less than the year before. The refineries' net production declined by 2.9 million tons from 58.5 million tons in 1970 to 55.6 million tons in 1971. Actual refining capacity in 1971 was about 80 million tons per year. Exports of oil products fell by 4 percent in 1971, from 33.8 million to 32.5 million tons. The consumption of oil products fell by 1.6 million tons, to 22.4 million tons in 1971, and the consumption of heavy fuel oil dropped sharply by 24 percent. This development was attributed to the completion of natural gas in an already weak market.[6]

Early in 1971, the Netherlands, West Germany, and Denmark signed treaties in Copenhagen on delimitation of the North Sea Continental Shelf. Agreement was reached on the transfer of certain North Sea blocks to West Germany and on a new demarcation that is based on geological structures and not on the old principle of equidistance laid down by the Geneva Continental Shelf agreement.

Placid International Oil Co. of Dallas, Tex., which had a gasfield discovery in the Netherlands North Sea early in 1971, was granted the first production license issued for the Netherlands Continental Shelf. The license covers the L/10 discovery block and the adjacent L/11 block, about 45 miles northwest of the Netherlands port of Den-Helder. Placid has announced plans to lay a pipeline from the field to the coast of the Netherlands and reportedly will begin gas production in 1973.

Although the explosive growth of natural gas expansion is still formidable, sales have started to slow down to a growth rate of 38.5 percent in 1971, compared with 44.5 percent in 1970 and 55.6 percent in 1969. The total volume sold by Gasunie (the Netherlands State Mines, 40 percent; the State, 10 percent; Shell, 25 percent; and Esso, 25 percent) during 1971 reached 43.5 billion cubic meters, compared with 31.4 billion in 1970. Gasunie expects that sales in 1972 will rise to 58 billion cubic meters and sales projections show about 85 billion cubic meters in 1975 and about 95 billion cubic meters in 1980. Of the total volume sold by Gasunie in 1971, about 26.3 billion cubic meters were supplied to the mainland

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[5] U.S. Embassy, The Hague, Netherlands. State Department Dispatch A-173, June 13, 1972.

[6] Petroleum Times. V. 76, No. 1931, Feb. 11, 1972, p. 7.

and the remainder, 17.2 billion, was exported. The export growth rate increased 52.6 percent in 1971 compared with a growth of 49 percent in 1970.

Export sales to West Germany increased 73.5 percent to 6.5 billion cubic meters. Sales to Belgium in 1971 increased 40.2 percent, to 6.3 billion cubic meters. France received 4.4 billion cubic meters, an increase of 45.1 percent. In the next few years the countries importing the Netherlands natural gas should benefit from the expansion in export sales because export volumes are predicted to reach over 40 billion cubic meters in 1975, almost equal to the forecast inland sales that year. Deliveries to West Germany in 1975 are expected to reach, in cubic meters, 14 billion; to Belgium, 11 billion; to France, 9 billion; to Italy, 6 billion; and to Switzerland, 0.5 billion. Internal consumption in the Netherlands is expected to grow from over 40 billion cubic meters to over 50 billion cubic meters in 1980.

The use of natural gas in the Netherlands has grown tremendously since large-scale distribution began in 1964 of over 1 billion cubic meters compared with an estimated 26.3 billion cubic meters in 1971. However, the percentage increase in sales on the home market has dropped from 42 percent in 1970 to 30.6 percent in 1971. The share of natural gas in the Nation's energy balance has grown spectacularly to well over 30 percent in 1971 and is likely to increase to 45 percent in 1975.

Natural gas is used in the Netherlands to a great extent in the generation of electricity. At the beginning of 1971 power stations fired with natural gas or by natural gas combined with oil accounted for 42 percent of the installed generating capacity.

Adding past consumption and estimated future consumption, it is estimated that a total of 400 billion cubic meters of natural gas will have been sold at home and abroad by 1975 or about one-fifth to one-sixth of their known natural gas reserves to prevent an imbalance being created between the various forms of energy by too great a demand surge for natural gas. At the end of 1971 the Netherlands Government was studying its gas-pricing policy.[7]

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[7] Petroleum Press Service. V. 39, No. 3, March 1972, pp. 86–87.

The Mineral Industry of New Zealand

By Robert A. Clifton [1]

The value of New Zealand's mineral production increased in 1971 to $76.91 million,[2] an apparent increase of over 39 percent from that of 1970. Dollar revaluation made this, in real terms, only a 29-percent increase. Nonmetallics—sand, rock and gravel, limestone, and clays—still dominate the industry with more than one-half of the mineral production value. The metallics provided the major portion of the increase as they increased by a factor of 6 their share of the production value since 1970. Value of total mineral production by year is shown in the following tabulation:

Year	Percent			Total value, million dollars [1]
	Metals	Non-metals	Fuels	
1967	1.0	67.7	31.3	58.89
1968	.8	67.6	31.6	50.99
1969	1.7	67.8	30.5	53.50
1970	3.2	66.8	30.0	55.15
1971	20.0	56.0	24.0	76.91

[1] Values for 1968, 1969, and 1970 converted from New Zealand currency devalued November 1967. 1971 value reflects revalued U.S. dollars.

New Zealand's efforts to lessen its economic dependence on farm products and a United Kingdom oriented market began to pay off in 1971. During the 4-year period ending March 1971, there was a 50-percent increase in value of exports, but the pastoral products share of these dropped from 87 percent to 82 percent. Manufactured exports doubled their share from 3.5 to 7.0 percent.

The effect of the operational status and initial shipments from the new aluminum smelter at Bluff are not reflected in the analysis above. The effect will be great, but its dependence on a Japanese market and that country's economy should be noted. Already a planned capacity increase has been postponed because of the Japanese recession.

Table 1.—New Zealand: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971 ^{p}
METALS			
Cadmium, mine output, metal content [1]	11	10	14
Copper, mine output, metal content [2]	^{r} 71	47	85
Gold, mine output, metal content [3] troy ounces	^{r} 10,400	11,283	9,418
Iron and steel:			
Iron ore, gross weight	^{r} 1,187	684	93
Iron sands, gross weight [4]	^{r} 19,478	143,436	575,882
Sponge iron thousand tons	--	23	^{e} 200
Crude steel do	^{e} 68	^{e} 68	200
Lead, mine output, metal content [2]	^{r} 905	778	1,246
Silver, mine output, metal content [2] troy ounces	21,950	16,428	66,398
Tungsten, mine output, metal content	8	5	7
Zinc, mine output, metal content [1]	^{r} 1,567	1,459	1,969

See footnotes at end of table.

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[1] Physical scientist, Division of Nonmetallic Minerals.

[2] Unless otherwise indicated, values herein are in U.S. dollars converted from New Zealand dollars at the rate of NZ$1 = US$1.21.

Table 1.—New Zealand: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971
NONMETALS			
Cement, hydraulic thousand tons	803	829	823
Clays:			
Bentonite	[r]5,720	20,039	11,761
Fire	260,376	256,902	284,478
Kaolin (including china clay)	10,048	11,641	20,243
Diatomite	2,163	5,883	6,338
Kauri gum	37	25	26
Magnesite	800	484	1,047
Perlite	--	2,032	2,032
Pumice	19,306	19,207	13,010
Salt	49,297	52,793	43,263
Sand and gravel:			
Glass sand	107,485	135,628	124,520
Common sand and gravel thousand tons	25,412	27,069	26,119
Stone:			
Dolomite	10,076	10,273	8,311
Limestone:			
Agricultural and industrial thousand tons	1,140	1,283	1,397
For cement do	1,494	1,523	1,536
Serpentine do	78	78	73
Unspecified:			
Dimension	22,551	19,366	31,222
Rock for harbor work thousand tons	2,801	1,251	2,197
Sulfur	--	122	--
MINERAL FUELS AND RELATED MATERIALS			
Coal:			
Bituminous thousand tons	488	450	389
Subbituminous do	1,705	1,746	1,573
Lignite do	171	190	162
Total do	2,364	2,386	2,124
Coke:			
Metallurgical do	5	6	--
Gashouse [5] do	48	36	--
Fuel briquets do	--	17	15
Gas, natural, marketed production million cubic feet	2	3,769	10,627
Petroleum:			
Crude thousand 42-gallon barrels	3	467	804
Refinery products:			
Gasoline do	9,472	10,394	10,029
Distillate fuel oil do	4,824	5,327	4,886
Residual fuel oil do	4,458	5,220	5,385
Other do	[r]1,373	1,101	1,049
Refinery fuel and losses do	1,453	1,588	--
Total do	[r]21,580	23,630	21,349

[e] Estimate. [p] Preliminary. [r] Revised.

[1] Contained in zinc concentrate.

[2] Contained in lead-copper concentrate.

[3] Includes that contained in lead-copper concentrate.

[4] Average 60 percent iron.

[5] Year beginning April 1 of that stated.

TRADE

During 1969–70 New Zealand's exports of mineral commodities increased NZ$1 million and imports decreased NZ$9 million compared with 1968–69.

Table 2.—New Zealand: Exports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1968–69	1969–70	Principal destinations, 1969–70
METALS			
Aluminum:			
Metal, including alloys:			
Scrap	1,132	1,372	Australia 1,131; Japan 181.
Unwrought and semimanufactures	469	510	Japan 212; Australia 198; Philippines 39.
Copper:			
Ore and concentrate	10	--	
Metal, including alloys:			
Scrap	744	1,428	Australia 859; West Germany 144; Japan 131.
Unwrought and semimanufactures	4,434	3,961	Japan 1,089; Australia 910; West Germany 602.
Gold, refined [2] value	$27,010	$29,074	NA.
Iron and steel:			
Ore and concentrate (iron sand)	--	30,985	All to Japan.
Metal:			
Scrap	5,818	7,099	Japan 2,482; Australia 2,271; West Germany 1,504.
Steel, primary forms	16	42	Taiwan 41.
Semimanufactures:			
Bars, rods, angles, shapes, sections	2,653	4,829	Fiji 4,000; American Samoa 222.
Universals, plates, and sheets	261	3,139	Fiji 941; Hong Kong 769; Kenya 303.
Hoops and strips	39	8	American Samoa 6; Singapore 1.
Wire	392	422	Hong Kong 324; Fiji 88.
Tubes, pipes, and fittings	202	254	Fiji 87; Western Samoa 69; Papua and New Guinea 40.
Castings and forgings, rough	31	30	Australia 29.
Lead:			
Ore and concentrate	1,137	1,935	Mainly to Japan.
Metal, including alloys:			
Scrap	1,188	1,020	Australia 649; Republic of South Africa 154; Belgium-Luxembourg 146.
Unwrought and semimanufactures	363	539	Australia 435; Malaysia 66.
Nickel metal, scrap	7	7	United States 3; United Kingdom 2; Australia 2.
Platinum-group metals and silver ores [2] value	$140,243	$91,922	Australia $51,917; United Kingdom $27,244; West Germany $12,761.
Tin metal, including alloys:			
Scrap long tons	17	--	
Unwrought and semimanufactures do	3	3	Australia 2; Fiji 1.
Zinc:			
Ore and concentrate	1,776	3,528	All to Japan.
Metal, including alloys:			
Scrap and ash	256	264	Japan 143; Australia 114.
Unwrought and semimanufactures	10	44	Italy 24; Australia 20.
Other:			
Ore and concentrate of base metals, n.e.s	63	145	Australia 139; United Kingdom 6.
Ash and residue containing nonferrous metals [2] value	$285,556	$375,237	Australia $190,299; Netherlands $70,358; Sweden $52,602.
NONMETALS			
Asbestos articles and building materials [2] do	$229,813	$503,883	Papua and New Guinea $185,425; Fiji $130,669; Western Samoa $120,458.
Cement	1,606	828	New Hebrides 261; Guam 255; Western Samoa 106.
Clays and products (including all refractory brick):			
Crude, n.e.s	690	1,592	Australia 1,531; Japan 30.
Products [2] value	$144,707	$125,187	Australia $52,565; Fiji $46,678; French Polynesia $7,091.

See footnotes at end of table.

Table 2.—New Zealand: Exports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1968–69	1969–70	Principal destinations, 1969–70
NONMETALS—Continued			
Fertilizer materials:			
Crude	3,103	1,828	United Kingdom 1,013; Malaysia 254; Japan 224.
Manufactured:			
Nitrogenous	26	128	Australia 81; Western Samoa 30.
Phosphatic	436	253	Fiji 108; Hong Kong 52.
Potassic	35	7	All to Western Samoa.
Other	92	415	Australia 401; French Polynesia 8.
Kauri gum	30	22	United States 11; Italy 8.
Lime	20	23	New Caledonia 21; Fiji 1.
Precious and semiprecious stones, except diamond [2] value	$442	$1,135	United Kingdom $1,035; Australia $100.
Pumice	611	872	Australia 584; United Kingdom 122; Fiji 85.
Stone, sand and gravel	331	341	American Samoa 270; Australia 16.
Stone, monumental [2] value	[r] $10,812	$19,239	Japan $10,531; Fiji $3,534; Western Samoa $1,738.
Other	37	68	United States 36; Australia 27.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	221	--	
Coal and coke, including briquets	308	5,403	New Caledonia 4,975; Singapore 272.
Petroleum refinery products:			
Gasoline (including natural) 42-gallon barrels	4	154	New Hebrides 111; Western Samoa 28; Pitcairn Island 9.
Distillate fuel oil do	875,591	957,074	Ships stores 957,071; Fiji 3.
Residual fuel oil do	1,673,559	1,031,045	Ships stores 591,836; Australia 238,163; Singapore 201,046.
Lubricants do	[r] 512	3,676	Ships stores 2,361; Fiji 1,116; Australia 116.
Other do	4,912	14,277	Wallis and Futuna Island 6,446; New Hebrides 3,850; New Caledonia 3,158.

[r] Revised. NA Not available.

[1] Fiscal period July 1 through June 30.

[2] Converted from NZ$ at a prorated value of US$0.995310.

Table 3.—New Zealand: Imports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1968–69	1969–70	Principal sources, 1969–70
METALS			
Aluminum:			
Oxides and hydroxides	2,752	3,048	Japan 2,547; United Kingdom 352.
Metals and alloys:			
Unwrought	9,827	13,258	Canada 7,792; Australia 3,192.
Semimanufactures	5,888	7,115	Canada 4,777; Australia 1,180.
Antimony metal [2] value	$39,058	$33,336	People's Republic of China $22,110.
Arsenic, trioxide, pentoxide and acid	164	138	People's Republic of China 82; Sweden 34.
Chromium oxides and hydroxides	112	215	United Kingdom 99; West Germany 81.
Copper metal, including alloys:			
Unwrought	175	171	United Kingdom 161.
Semimanufactures	11,075	11,670	Australia 9,441; United Kingdom 1,183.
Gold, metal unworked troy ounces	9,728	13,479	Australia 7,591; United Kingdom 5,720.
Iron and steel:			
Metal:			
Pig iron, including cast iron	6,552	7,623	Mainly from Australia.
Sponge iron, powder and shot	479	616	United Kingdom 365; Sweden 140.
Spiegeleisen	202	126	Republic of South Africa 96; India 30.
Ferroalloys	1,708	3,286	India 1,357; Republic of South Africa 1,248.
Steel, primary forms	1,206	125	Austria 50; United Kingdom 31.
Semimanufactures:			
Bars, rods, angles, shapes, sections	131,575	150,496	Australia 117,494.
Universals, plates, and sheets	227,449	247,086	Japan 136,874; Australia 74,350.
Hoop and strip	12,879	13,429	United Kingdom 5,282; Australia 3,919; Japan 3,528.
Rails and accessories	10,322	9,065	United Kingdom 3,444; Australia 3,182.
Wire	17,434	21,061	Australia 10,342; United Kingdom 8,138.
Tubes, pipes, and fittings	53,045	52,328	Australia 24,287; United Kingdom 17,094.
Castings and forgings, rough	83	35	Mainly from United Kingdom.

See footnotes at end of table.

Table 3.—New Zealand: Imports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1968–69	1969–70	Principal sources, 1969–70
METALS—Continued			
Lead:			
Ore and concentrate	230	--	
Oxides	517	650	Australia 528; United Kingdom 116.
Metal, including alloys:			
Scrap	103	6	All New Zealand reimports.
Unwrought	4,485	5,921	Mainly from Australia.
Semimanufactures	9	24	Australia 14; United Kingdom 8.
Magnesium metal, unwrought	20	60	Mainly from United States.
Manganese:			
Ore and concentrate	103	17	Australia 15.
Oxides	701	533	United States 350; Japan 113; Australia 52.
Mercury 76-pound flasks	75	272	Italy 100; Spain 65; United Kingdom 38; Mexico 32.
Nickel metal, including alloys:			
Unwrought	107	29	United Kingdom 17; Canada 11.
Semimanufactures	171	224	United Kingdom 144; Australia 40.
Platinum-group metals and silver:			
Metal, including alloys:			
Platinum group thousand troy ounces	3	2	United Kingdom 1.
Silver do	1,884	1,266	Australia 1,087; United Kingdom 152.
Tin:			
Oxides long tons	15	13	Mainly from United Kingdom.
Metal, including alloys:			
Unwrought do	r 320	334	Malaysia 160; Australia 154.
Semimanufactures do	23	36	United Kingdom 19; Australia 16.
Titanium oxides	1,117	990	Australia 764; Japan 161.
Zinc:			
Oxide and peroxide	22	24	Australia 11; United Kingdom 7.
Metal, including alloys:			
Scrap and blue powder	64	152	Australia 73; United States 50.
Unwrought	9,655	15,196	Mainly from Australia.
Semimanufactures	503	533	United Kingdom 270; Australia 207.
Other:			
Ore and concentrate	410	738	Australia 671.
Ashes and residues containing nonferrous metals	8	--	
Oxides, hydroxides and peroxides of metal, n.e.s	120	124	United Kingdom 45; West Germany 36.
NONMETALS			
Asbestos	5,853	8,662	Canada 6,665; Republic of South Africa 1,796.
Barite	1,578	5,903	Australia 5,097; United States 379.
Cement	r 2,904	3,502	Japan 1,552; United Kingdom 1,466.
Chalk	998	750	United Kingdom 312; France 265; Belgium-Luxembourg 101.
Clays and products:			
Crude, n.e.s.:			
Fuller's earth, chinas, chamotte	366	498	United Kingdom 454; Australia 23.
Kaolin (china clay)	3,906	2,679	United States 1,648; United Kingdom 871; Australia 145.
Other	3,662	3,453	United States 1,884; United Kingdom 746; Australia 617.
Products, refractory (including nonclay bricks)	486	1,330	United Kingdom 1,155; Japan 91.
Cryolite and chiolite	27	17	Denmark 11; Australia 5.
Diamond:			
Gem, not set or strung [2] value, thousands	$1,268	$681	Republic of South Africa $418; United Kingdom $193.
Industrial [2] do	r $33	$62	Republic of South Africa $53; United Kingdom $5.
Diatomite and other infusorial earths	1,015	1,842	Mainly from United States.
Feldspar, fluorspar, and nepheline syenite	1,979	3,709	Sweden 2,805; Norway 257.
Fertilizer materials:			
Crude:			
Nitrogenous	1,075	457	Chile 264; United States 193.
Phosphatic thousand tons	1,036	1,071	Nauru 611; Australia 255; Gilbert Islands 169.
Other	1	2	All from United States.
Manufactured:			
Nitrogenous	29,435	37,231	Japan 16,660; West Germany 5,716.
Phosphatic, including basic slag	10,644	15,897	United States 9,372; Belgium-Luxembourg 5,197.
Potassic	r 149,573	164,624	United States 82,362; Canada 66,679.

See footnote at end of table.

Table 3.—New Zealand: Imports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1968–69	1969–70	Principal sources, 1969–70
NONMETALS—Continued			
Graphite, natural	101	123	United Kingdom 49; Japan 28.
Gypsum and plasters	96,583	104,552	Mainly from Australia.
Lime	297	233	All from United Kingdom.
Magnesite	307	265	India 171; Australia 65.
Pigments, minerals, including processed iron oxide	914	818	West Germany 345; Austria 219.
Precious and semiprecious stones, except diamond [2] value, thousands	[r] $417	$290	Australia $117; West Germany $72.
Salt and brine	36,025	37,350	United Kingdom 28,737; Australia 6,877.
Sodium and potassium compounds, n.e.s.	[r] 7,355	7,503	Netherlands 2,365; United Kingdom 2,249.
Stone, sand and gravel:			
Dimension stone	[r] 1,285	1,116	Republic of South Africa 528; Sweden 151.
Gravel and crushed rock	137	58	United Kingdom 39; France 10.
Limestone	12	12	All from United Kingdom.
Quartz and quartzite	1,487	887	Belgium-Luxembourg 452; Australia 311; United Kingdom 65.
Sand, excluding metal bearing	272	705	Mainly from Australia.
Sulfur, elemental, all forms	160,273	246,897	Canada 180,989; United States 65,236.
Talc, steatite, soapstone and pyrophyllite	1,677	1,777	Australia 1,557; United States 133.
MINERAL FUELS AND RELATED MATERIALS			
Bitumen, natural	295	360	Trinidad and Tobago 247; United States 112.
Carbon black and gas carbon	5,475	6,160	Australia 4,350; United States 1,470.
Coal and coke, including briquets	41	13	All from United Kingdom.
Gas hydrocarbon [2] value, thousands	$123	$127	Australia $94; United States $31.
Peat, including peat briquets and litter	22	47	Ireland 37; United Kingdom 10.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	[r] 21,624	22,132	Kuwait 11,415; Saudi Arabia 4,818; Brunei 1,510.
Refinery products:			
Gasoline do	1,855	2,463	Iran 1,030; Australia 419; South Yemen 400.
Kerosine and jet fuel do	1,538	1,694	Australia 690; Iran 350; South Yemen 279.
Distillate fuel oil do	1,229	1,790	Australia 762; Bahrain 443; Singapore 200.
Residual fuel oil do	2	--	
Lubricants [2] value, thousands	$4,407	$3,457	Australia $1,766; United States $913; United Kingdom $657.
Mineral jelly and wax [2] do	$528	$883	United States $360; India $114; People's Republic of China $101.
Other [2] do	$1,690	$1,178	United States $594; Australia $217; United Kingdom $115.
Mineral tar from coal-, petroleum-, or gas-derived crude chemicals thousand 42-gallon barrels	30	52	Indonesia 24; United States 17.

[r] Revised.

[1] Fiscal period July 1 through June 30.

[2] Converted from NZ$ at a prorated value of US$0.995310.

COMMODITY REVIEW

METALS

Aluminum.—The Bluff smelter became completely operational during 1971. At the official opening on November 30, 1971, it was producing at the planned 73,000 metric tons per year capacity. The planned for, and built in, capacity to expand to 110,000 tons per year will be delayed because of recessions in major markets. Two shipments totaling 10,000 tons were scheduled for Japan before the end of 1971. Aluminum for the domestic market was scheduled for 1972. An aluminum fabrication industry was beginning to appear, and there was renewed interest in the North Island bauxite deposits.

Iron and Steel.—Iron sand concentrate shipments began from the Waipipi-Waverly deposit by a unique offshore pipeline loading method. Waipipi Ironsands Ltd. has contracts with Japanese firms to supply 11 million tons of concentrate over the next 10 years. New Zealand Steel Ltd. has similar contracts for their iron sands project at Lake Taharoa. While not exporting in 1971, New Zealand Steel started captive consumption at its Glenbrook steelworks. JBL Exploration Ltd. was actively considering a third iron sands project both off and onshore in the Taranaki Bight area.

South Island has entered the iron and steel picture as the result of a major prospecting find. Consolidated Mining Co. said that the find, reportedly of 50 million tons of gabbro body containing magnetite, ilmenite, and vanadium pentoxide, may result in the establishment of a smelter using West Coast coal.

Silver.—Consolidated Silver Mining Co. of New Zealand, Ltd. reported high silver values in its Maratoto Valley, North Island mine, and Southern Cross Minerals Exploration reported that production is virtually assured from its find in an old mining area on the Coromandel Peninsula.

Tungsten.—The mountain country of Central Otago, near Glenorchy, has a 200-square-mile zone of scheelite mineralization. A little of the ore was mined in previous years, but the low price of tungsten on the market forced closing. The seemingly stable high prices have stimulated the interest of several companies and private prospectors in the Otago deposits. Chief among these is Alex Harvey Industries Ltd. with 2½ years of investigation, a pilot processing mill, and creation of its new company, New Zealand Tungsten Mining Corporation for continued development. The Geological Survey reported an encouraging 1.25 percent scheelite in the ore.

NONMETALS

Asbestos.—A deposit of short fiber chrysotile was being investigated in Cobb Valley, Nelson, with a mining operation a distinct possibility. Another prospect in Red Hills, Otago, was undergoing evaluation.

Clays.—With proved reserves exceeding 7 million tons, the halloysite deposit at Te Pene in Northland was the center of major interest. Development as a large scale export industry was under way and an annual sales of NZ$5 million was a hoped-for goal.

Stone.—*Limestone.*—Finding an export market for limestone from four major high quality deposits looked favorable. The deposits are:

1. At Takaka, Nelson, where several hundred million tons of marble (97 percent $CaCO_3$) are presently being quarried.
2. At Kellard Point, Fiordland, where an estimated 15 million tons of 85 percent $CaCO_3$ marble is located. There is no present production.
3. In the Lower Waitaki Valley, where an estimated 450 million tons of plus 92 percent $CaCO_3$ limestone is located. About 70,000 tons per year were being quarried for various uses.
4. At Dunback, Otago, where 150 million tons of plus 93 percent $CaCO_3$ Paleozoic limestone was available, but not being quarried.

Sulfur.—The option on the Taupo Quarries Ltd. sulfur deposits that were held by American Cyanamid Co. were relinquished to Gulf Resources and Chemical Corp. and its New Zealand Partner, Fletcher Holdings Ltd. Test boreholes were being drilled, and recovery tests on the 6-million-ton deposit were scheduled. Other promising areas nearby were under investigation.

MINERAL FUELS

Coal.—Coal production during 1971 was 89 percent of 1970 production. A possible reason for the loss will be found in the natural gas section below. New export markets and/or a steel industry boom seem to be the best answers to this problem.

Peat.—Pan Pacific Mining Corp. revealed plans for financing an operation to develop peat wax deposits on Chatham Island. Testing has indicated that the deposits could sustain production of 20,000 tons of wax per year for an indefinite period.

Petroleum and Natural Gas.—Natural gas production increased 182 percent over that of 1970. The pipeline to urban markets undoubtedly accounted for this increase. Availability of this additional gas also made inroads in the traditional coal markets. The production was from the Kapuni field where proven reserves represent about twice the annual energy supply for New Zealand. Estimates of the Maui field reserves are 20 times larger than those of Kapuni. Even with this abundance, natural gas is not expected to supply a major portion of the country's energy needs until 1980. The Government and Shell-BP-Todd Oil Services Ltd. seem in no hurry to conclude the negotiations as to the revenue split from the Maui gas. Even after 18 months there was no sign of haste from either party.

The Mineral Industry of Nigeria

By Gertrude N. Greenspoon[1]

The rapid growth of the Nigerian economy, with the petroleum industry increasing faster than all other sectors, continued throughout 1971. Gross domestic production (GDP) rose about 12 percent in 1971 compared with a nearly 10-percent increase in 1970. Population in 1971 was 56.5 million, 23 percent urban, and growing at an annual rate of 2.5 percent.[2] In 1970, the gross national product (GNP) was $5.8 billion[3] and $105 per capita compared with a GNP of $5.45 billion and a per capita GNP of $125 in 1966, the last full year before the outbreak of the civil war.

With a production of nearly 1.7 million barrels per day in late 1971, Nigeria now ranks ninth in world production of crude oil. The increased oil production combined with higher prices per barrel, beginning in September as a result of new price agreements, greatly increased Government revenue. The oil industry now accounts for over one-half of the budget revenue. It assures adequate funds to meet current needs of the growing Government sector, reduces Government internal debt, and also reduces substantially the need for internal and external borrowing to finance development plans. In addition, increased oil revenues which financed a large flow of imports, have abated somewhat the inflationary forces which had troubled the economy, particularly right after the civil war.

Nigeria maintained its sixth place ranking among free world tin-producing nations, after losing fifth place to Australia in 1970. The country continued as the third leading producer in the free world in output of columbite, produced as a coproduct of tin ore mining.

Government policy for promoting Nigerianization shifted from personnel policy to ownership in the private sector. A new policy was announced in June reserving a broad range of small trading, service, and light manufacturing industries exclusively for Nigerian ownership. The announcement also included an additional list of medium-scale industries which would have 40 percent Nigerian ownership. A National Oil Corp. (NOC) was established to implement the oil policy described in the national development plan. In mid-1971, the Government acquired a one-third interest in two oil companies, and is requiring at least 51 percent participation in new mining concessions.

Virtually all import restrictions were relaxed April 1. This liberalization of trade together with the institution of a system to release payment for most imports 90 or 180 days after arrival resulted in a surge in imports in mid-1971 to a record $1,507 million for the year.

The Nigerian Government announced on December 23 that the exchange rate for the Nigerian pound is one Nigerian pound to US$3.04 and the rate for sterling will be about £117 sterling to £100 Nigerian given the new rate of US$2.60 to the pound sterling. The Ministry of Finance emphasized again that the external value of the new Nigerian pound is not tied to the dollar, sterling, or any other foreign currency.[4]

Improvements to port facilities continued throughout 1971. Congestion at Lagos was released considerably, and seven new berths will be constructed in the next 3 years. Dredging operations to enable more ships to use the port facilities at Calabar and

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[1] Mineral specialist, Division of Nonferrous Metals.

[2] Agency for International Development. Economic Data Book. Revision No. 279, May 1972, p. 5.

[3] Where necessary, values have been converted from Nigerian pounds (N£) to U.S. dollars at the rate of N£1=US$2.80.

[4] Standard Bank Limited, (London). Standard Bank Review, Nigeria. January 1972, p. 14.

Warri will further ease the pressure on Lagos. Other transport activities include construction of the 75-mile Kano-Tudunwada-Jos road, and opening of the EKO Bridge extension providing easier access between the island and mainland Lagos.

PRODUCTION

As in 1970, the petroleum industry dominated Nigerian mineral production in 1971. Both crude and refined petroleum recorded substantial increases in output. The production of crude petroleum rose from 1.4 million barrels per day in January to nearly 1.7 million in December. Tin concentrate production was 5 percent below that of 1970 but output of tin metal was only slightly less than the preceding year. Despite a fourfold increase, coal production was still far below the 1966 output, the last full year of operation before the civil war.

Table 1.—Nigeria: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity[1]	1969	1970	1971[p]
METALS			
Columbium and tantalum:			
Columbite concentrate	1,515	1,617	1,379
Tantalite concentrate	6	4	4
Gold troy ounces	298	123	36
Rare-earth metals, monazite concentrate	13	13	102
Tin:			
Mine output, cassiterite concentrate:			
Gross weight long tons	11,630	9,759	9,242
Tin content do	8,603	7,833	7,005
Smelter do	8,839	[r]7,941	7,243
NONMETALS			
Cement thousand tons	[r]557	[r]587	654
Clays, kaolin	469	579	153
Stone:			
Limestone thousand tons	691	678	474
Marble	1,168	1,098	3,326
Salt	[r]2,196	NA	NA
MINERAL FUELS AND RELATED MATERIALS			
Coal	15,854	[r]35,799	157,950
Gas, natural:			
Gross production million cubic feet	145,714	[r]284,933	458,169
Marketed production do	2,252	3,920	[e]6,300
Petroleum:			
Crude thousand 42-gallon barrels	197,204	395,836	558,375
Refinery products:			
Gasoline do	--	1,848	3,767
Kerosine do	--	1,166	2,117
Distillate fuel oil do	--	1,718	3,532
Residual fuel oil do	--	2,317	4,665
Liquefied petroleum gas do	--	13	24
Refinery fuel and losses do	--	338	411
Total do	--	7,400	14,516

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, a variety of crude construction materials are also presumably produced, but available information is inadequate to make reliable estimates of output levels.

TRADE

Nigeria's foreign trade increased substantially in 1970. Both exports and imports registered gains over 1969, but the increase in imports exceeded that of exports, and the favorable trade balance declined to $181 million, $14 million less than in 1969. Total value of exports rose 39 percent over 1969; crude petroleum accounted for 95 percent of the increase. The value of imports, the highest recorded, was 52 percent greater than in 1969.

Crude petroleum accounted for $333 million of the $349 million increase in exports in 1970, and its share of total exports rose from 42 percent in 1969 to 58 percent in 1970. The export value of tin metal increased $8 million in 1970.

The large increase in imports was distributed among all commodities except mineral fuels and lubricants which decreased owing to the resumption of operations at the Port Harcourt refinery. Postwar reconstruction, together with a construction boom outside war affected areas, resulted in a substantial increase in imports of building materials. Cement imports rose 500 percent and bricks, conduits, and roofing tiles gained 59 percent. Iron and steel products rose 89 percent and large increases were made in imports of machinery, transport equipment, chemicals, and miscellaneous manufactured products.

In 1971, Nigeria's export surplus declined 16 percent as imports continued to increase. Exports were valued at $1,659 million while import values totaled $1,507 million. As in 1970, crude oil continued as the principal contributor to Nigeria's trade surplus. The 42-percent increase in imports reflected large gains in receipts of both capital goods and consumer goods. Mineral fuel imports dropped 59 percent because of increased production at the refinery at Port Harcourt.

The value of mineral trade and total trade in recent years was as follows:

	Value (million dollars)	
	Mineral commodity trade	Total commodity trade
Exports:		
1968	147	587
1969	424	[r] 891
1970	762	1,240
Imports:		
1968	105	[r] 539
1969	126	696
1970	NA	1,059

[r] Revised. NA Not available.

Table 2.—Nigeria: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Columbite, ore and concentrate	[r] 1,331	1,792	United Kingdom 621; Japan 420; United States 378.
Iron and steel:			
Scrap	[r] 20,497	12,536	France 3,709; West Germany 3,048; Spain 3,018.
Semimanufactures	7	3	All to Mali.
Lead, ore and concentrate	(1)	5	All to Ethiopia.
Nickel and nickel alloys, worked	163	--	
Platinum-group metals, including alloys	--	756	All to United Kingdom.
Tantalum, ore and concentrate	17	4	Netherlands 3; West Germany 1.
Tin:			
Ore and concentrate ... long tons	4	3	All to United Kingdom.
Metal, including alloys, unwrought do	10,110	10,731	United Kingdom 6,991; Netherlands 1,175.
Zinc:			
Ore and concentrate	43	61	All to Belgium-Luxembourg.
Metal, including alloys	--	32	All to United Kingdom.
Other nonferrous base metals:			
Ore and concentrate	1,110	1,485	United States 1,118; West Germany 305.
Scrap	[r] 2,411	5,270	West Germany 2,023; Spain 1,448; Belgium-Luxembourg 548.
NONMETALS			
Cement	[r] 3	4	All to former French Equatorial Africa.
Fertilizers, crude	233	86	Ivory Coast 42; Togo 27.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	1,048	1,819	Togo 702; former French Equatorial Africa 658.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	198,962	377,046	United Kingdom 88,351; Netherlands 68,917; United States 50,209.
Refinery products:			
Gasoline (including natural) do	1	--	
Kerosine do	--	(1)	
Jet fuel do	(1)	134	Netherlands Antilles 132.
Distillate fuel oil do	--	(1)	
Residual fuel oil do	21	9	Dahomey 4.
Lubricants do	--	474	Ghana 389.
Other do	--	6	Dahomey 2.

[r] Revised.

[1] Less than ½ unit.

Source: Nigeria Trade Summary, Nigerian Federal Office of Statistics, December issues for 1969 and 1970.

Table 3.—Nigeria: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum, metal and alloys:			
Unwrought	138	248	West Germany 236; United Kingdom 10.
Semimanufactures	4,553	8,128	Switzerland 2,467; United Kingdom 2,268; West Germany 1,372.
Copper, metal and alloys:			
Unwrought	10	20	All from United Kingdom.
Semimanufactures	884	1,707	United Kingdom 898; Italy 568.
Iron and steel:			
Metal:			
Pig iron, ferroalloys and other similar materials	754	611	United Kingdom 445; United States 161.
Spiegeleisen	--	91	All from United Kingdom.
Steel, primary forms	8,286	14,816	West Germany 9,676; Netherlands 1,681; United Kingdom 1,415.
Semimanufactures	[r] 326,075	564,075	United Kingdom 98,490; Japan 97,088; United States 75,843.
Lead, metal, including alloys:			
Unwrought	722	417	United Kingdom 381; Denmark 17.
Semimanufactures	186	113	West Germany 68; United Kingdom 20.
Nickel, metal, unwrought and semimanufactures	12	76	Canada 33; United Kingdom 19.
Platinum-group metals, unworked troy ounces	2,985	46,647	West Germany 25,876; United Kingdom 16,935.
Silver, metal, unworked or partly worked do	13,186	1,390,112	United Kingdom 1,379,690.
Tin, metal and alloys, all forms long tons	[r] 458	191	United Kingdom 107; Denmark 47.
Zinc, all forms, including alloys	6,271	4,854	Zaire 2,806; West Germany 1,643.
Other:			
Ore and concentrate of nonferrous base metals	519	386	United Kingdom 377.
Nonferrous metal scrap	[r] 185	903	West Germany 518; United Kingdom 313.
Oxides, hydroxides and peroxides of metals	[r] 1,029	9,416	United Kingdom 5,988; West Germany 1,633.
Miscellaneous base metals, nonferrous, all forms	[r] 22	7	NA.
NONMETALS			
Abrasives:			
Natural	125	210	United States 181.
Grinding and polishing wheels and stones	[r] 52,435	4,747	United Kingdom 1,352; Italy 1,061.
Asbestos	20,358	34,443	Canada 28,963.
Cement	104,531	446,055	U.S.S.R. 84,784; Romania 61,480; Arab Republic of Egypt 59,814; Belgium-Luxembourg 59,230.
Clay construction materials	9,467	14,157	United Kingdom 4,057; West Germany 3,453; Netherlands 2,136.
Fertilizer materials:			
Crude	2,136	5,988	Ivory Coast 2,658; Yugoslavia 752.
Manufactured:			
Nitrogenous	4,251	7,233	West Germany 6,508.
Phosphatic	26,512	14,329	Netherlands 6,386; West Germany 3,892.
Potassic	[r] 474	1,335	East Germany 741; West Germany 417.
Other, n.e.s	11,980	5,210	Italy 1,978; West Germany 1,653.
Ammonia	453	1,655	West Germany 1,053; United Kingdom 447.
Lime	7,713	5,053	United Kingdom 4,801.
Mica	146	311	West Germany 257; Italy 32.
Salt	140,153	143,638	United Kingdom 105,321; Poland 21,443.
Stone, dimension worked	3,937	534	Italy 291; United Kingdom 244.
Stone, sand and gravel	25,370	40,833	France 30,718; United Kingdom 5,241.
Sulfur, all forms	118	342	France 217; United Kingdom 69.
Other, n.e.s	3,233	5,770	United Kingdom 1,451; Lebanon 738; France 655.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt, natural	[r] 79,864	62,263	Greece 21,601; Venezuela 9,445; United Kingdom 9,110; United States 8,235.
Coal, coke and briquets	5,014	5,280	United Kingdom 4,279.
Petroleum refinery products:			
Aviation gasoline thousand 42-gallon barrels	110	113	United Kingdom 55.
Motor gasoline do	2,892	1,784	Italy 1,031.
Kerosine do	[r] 1,060	550	Italy 351; Algeria 78.
Jet fuel do	781	546	Italy 263; Netherlands Antilles 83.
Distillate fuel oil do	[r] 2,428	1,316	Italy 495; Trinidad and Tobago 222.
Residual fuel oil do	[r] 2,262	789	Netherlands 254; Italy 227.
Lubricants do	[r] 238	218	United States 61; United Kingdom 35.
Mineral jelly and wax do	17	17	Netherlands 6; United States 5; West Germany 4.
Other do	[r] 112	165	Netherlands Antilles 118.

[r] Revised. NA Not available.

Source: Nigeria Trade Summary, Nigerian Federal Office of Statistics, December issues for 1969 and 1970.

COMMODITY REVIEW

METALS

Iron and Steel.—A contract was signed with the U.S.S.R. for geological investigations for iron ore deposits, coal, and other raw materials required for the proposed iron and steel plant in Nigeria. The investigations are expected to be completed during the second development plan and construction of the basic iron- and steel-making plant is to begin in 1974. The cost of the project is estimated at about $336 million and mill capacity will be about 750,000 tons annually.

Tin.—Production of tin in Nigeria, concentrated in the region around Jos, has declined within the last few years. Costs are rising faster than prices, and lower-grade ore bodies are being mined. Physical conditions resulting from the aftermath of the war were also responsible for decreased output.

At the present time, all tin production is refined in Jos by the Makeri Smelting Co. During 1971, the smelter operated at about 50 percent capacity. Over the past 4 years, Nigeria's output of tin in concentrates dropped from 9,684 long tons in 1968 to 7,005 long tons in 1971. The Government has given monetary incentives to the Nigerian Tin Production and Development Loans Fund Committee as an aid to indigenous miners to purchase mining equipment. The loans, offered at 2 percent below bank loan interest, are repayable according to the number of years the equipment serves the miner.

Amalgamated Tin Mines of Nigeria, Ltd., Nigeria's largest producer, produced 3,557 tons of tin concentrate in 1971 compared with 3,878 tons in 1970. The average value of the ground worked was about the same in both years—0.64 pound per cubic yard in 1971 and 0.65 pound in 1970—but the quantity of ground excavated dropped 6 percent. Total production was obtained by the following methods:

Method	*Long tons*
Dragline washing plants	723
Gravel pumps	2,036
Dredge	184
Contractors	610
Mill tailings	4
Total	3,557

Ore reserves at the end of 1971 totaled 35,900 tons averaging 0.675 pound of tin per cubic yard.

NONMETALS

Cement.—Nigeria's chronic cement shortage was aggravated by a labor "slow down" at the West African Portland Cement Co. Ltd. plant at Ewekoro near Abeokuta in Western State, about 30 miles north of Lagos. A third kiln was being installed at the Ewekoro plant and when completed in 1972 the annual capacity of the plant will be increased from 600,000 to 840,000 tons. Production was started in September 1971 with one kiln at the Nigerian Cement Co., Ltd., Nkalagu plant that was closed during the civil war. Full production was anticipated with two more kilns by yearend. Five of the six original kilns were considered repairable. The Calabar cement plant is expected to operate at its rated capacity of 100,000 tons per year, when power will be supplied from the Afam power station in late 1971. The Ukpilla cement plant in the Midwest was being completed by Udygog Nigerian Ltd. Nigerian Cement Co., Ltd. started operation of the third kiln at its Enugu plant increasing the annual capacity to 350,000 tons.

MINERAL FUELS

Coal.—Despite reduced demand for coal, output rose from 7,000 tons in June 1970 to 15,000 tons in June 1971, reflecting the reopening of the Enugu coal mines. Production of 158,000 tons in 1971, however, was substantially below output prior to the civil war. As dieselization of the railways and development of the hydroelectric powerplant continue, the demand for coal will decline further.

Natural Gas.—Production of natural gas in association with crude oil averaged 1.2 billion cubic feet per day (cfd) in 1971 compared with a daily average of 780.6 million cfd in 1970. An average of 7.0 million cfd was used by petroleum companies to generate electric power for their own needs and 10.8 million cfd was sold to the Electric Power Co. of Nigeria as fuel for the thermal power stations at Afam and Ughelli or to industrial consumers in the area. A very small quantity was reinjected into wells and the remainder of the output was flared at the wellhead.

Petroleum.—Although petroleum production continued the upward trend begun during 1970, total output rose only 41 percent in 1971 compared with a 100-percent increase in 1970 over the previous year. Crude production, which averaged a prewar monthly high of 582,000 barrels per day in April 1967, rose to 1.1 million barrels in 1970 and to 1.5 million barrels in 1971. Since much of the rapid growth in 1970 was attributed to the exploitation of fields proven during the war when large scale work could not be performed, it was doubtful that such growth could be achieved again.

Production totaled 558 million barrels in 1971 and exports were 548 million barrels. Of the total exports, 19 percent went to the United States making it the largest single market for Nigerian crude oil. Deliveries to the refinery were 14.5 million barrels (7.4 million in 1970), and refinery output rose substantially.

Direct Government involvement in all phases of the petroleum industry was realized in April with the establishment of the NOC. The first action of NOC was an agreement with Safrap (Nigeria), Ltd., whereby NOC acquired a 35-percent interest in the company. This interest will be increased after production reaches 250,000 barrels per day to a maximum of 50 percent at 400,000 barrels per day. Following this arrangement, Safrap resumed production from the Obagi field in May. A one-third interest was also acquired in the partnership of Nigerian Agip Oil Co. Ltd. and Phillips Petroleum Co. (Nigeria).

On April 23, the Government announced that an agreement had been reached with Shell-BP Petroleum Development Company of Nigeria, Ltd. (Shell-BP), Nigeria's major producer. The 5-year agreement included a posted price of $3.21 per 34° API barrel, a 55-percent tax rate, a 2.5 percent escalation clause against inflation, and a 5-cents-per-barrel annual price increase. Nigeria's share is estimated at $1.50 to $1.60 per barrel and Government revenue could reach nearly $900 million in 1971 compared with about $500 million which would have been expected under the tax terms in effect prior to September 1970. Shell-BP signed the agreement on May 10, and Mobil Exploration Nigeria, Ltd., and Nigerian Gulf Oil Co., Ltd. on May 12, followed by other producers.

The Nigerian Petroleum Refinery Corp., Port Harcourt refinery, which resumed production in May 1970 with a throughput of 434,000 barrels of crude oil, processed more than 1.5 million barrels in September 1971. Although capacity was expanded to 55,000 barrels per day, the refinery is not able to supply all of Nigeria's gasoline requirements. Primary input to the refinery is a high-gravity crude oil with a large yield in gasoline. To meet Nigeria's fuel oil needs, however, the refinery must periodically process a low-gravity crude with virtually no gasoline output. Since about 25 percent of the output consists of a high-gravity fuel oil which cannot be used in Nigeria, this portion is exported to North American markets. No decision had been reached by yearend on building the second refinery included in the 4-year development plan.

The Nigerian Government approved the establishment of a Petroleum Training Institute to be located at Warri, an oil center. The Institute will cost $2.52 million of which the Soviet Union will furnish $714,000 as a medium-term loan. Annual enrollment would be 240 students for a 2-year course in a variety of jobs connected with the oil industry.

At the 24th Conference of the Organization of Petroleum Exporting Countries (OPEC) held in Vienna in July, Nigeria became the eleventh member of the organization.

Negotiations between the Government and five companies, which had been granted tentative offshore petroleum concessions in August 1970, continued throughout 1971. On October 19, an agreement was signed with Occidental Petroleum of Nigeria, Ltd. to explore for and develop petroleum resources off the Nigerian coast at Brass. Under terms of the agreement, the Government will have a 51-percent interest in the concessions when oil is found in commercial quantities. Two additional agreements similar to the Occidental agreement were signed on December 16. Offshore oil prospecting licenses were signed with both Japan Petroleum Co. (Nigeria) Ltd.

(a joint venture of Teijin, Ltd., Teikoku Oil, and Mitsui Oil working through a Japanese company called Nigeria Oil Co., Ltd.) and the West German firm, Deminex Nigeria, Ltd., in partnership with the Niger Petroleum Co., Ltd. Both agreements provide for joint ventures in which the Nigerian Government will hold a 51-percent interest in prospecting for oil offshore and in exploitation if oil is found.

The Mineral Industry of Norway

By F. L. Klinger[1]

Despite relatively slack foreign demand and falling prices in several important sectors, the Norwegian mineral industry continued to increase productive capacity and achieved record production of many commodities in 1971. Production and exports of ferroalloys, aluminum, and other important commodities were close to the levels of 1970, while imports of steel and fuels were reduced. Significant expansions were evident in the iron ore, ferroalloys, aluminum, and petroleum sectors. In the North Sea, a new gasfield was discovered and production of crude oil began from the Ekofisk field.

PRODUCTION

Volume indices of production for various branches of the mineral industry in 1969–71 are shown by the following tabulation. Most of the indices for 1969 and 1970 were revised.

Industry sector	1961 = 100		
	1969	1970	1971
Mining and quarrying:			
Coal mines	118	140	181
Metal mines	217	234	240
Mineral quarries	148	145	149
Stone, sand and gravel	212	213	241
Mineral processing:			
Primary metals	195	198	205
Nonmetallic mineral manufacturing	155	159	171
Coal and petroleum	191	211	215
Chemicals	170	174	179
All mining and quarrying	197	209	227
All industry	153	159	165

Source: Statistisk Sentralbyrå (Oslo). Statistisk Månedshefte (Monthly Bulletin of Statistics), No. 2, 1972, pp. 18–19.

In the metal mining sector, the higher index of production in 1971 was mainly generated by increased output of pyrite and crude ores of titanium, copper, and molybdenum, which offset a drop in production of iron ore. Among the nonmetals, substantial increases were reported in quarry output of limestone and dolomite, nepheline syenite, and olivine, while production of graphite declined. Production of cement, most of which was for export, continued to rise. In primary metals, a sharp gain in output of manganese ferroalloys offset a decline in production of pig iron and steel. Aluminum production was essentially unchanged from the 1970 level, but output of most other nonferrous metals increased. In the fuels sector, output of coal from the Spitzbergen mines was less than in 1970, while in the North Sea, production of crude oil began from the Ekofisk field.

Detailed production data are summarized in table 1.

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[1] Physical scientist, Division of Ferrous Metals.

Table 1.—Norway: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971 [p]
METALS			
Aluminum:			
Alumina [e]	11,000	2,500	NA
Metal:			
Primary ingot	507,943	530,167	528,631
Secondary ingot	17,758	[e] 18,000	[e] 18,000
Superpure [e]	3,000	3,000	NA
Cadmium, smelter production	90	98	92
Cobalt	735	782	869
Copper:			
Mine output, metal content:			
In copper concentrate	13,886	12,948	15,293
In cupriferous pyrite	7,258	6,999	7,196
Total	21,144	19,947	22,489
Metal:			
Primary:			
Blister	27,890	32,092	34,257
Refined	22,063	25,806	27,717
Secondary	12,005	[e] 12,000	[e] 12,000
Iron and steel:			
Iron ore and concentrate thousand tons	3,854	4,006	3,911
Roasted pyrite do	161	[e] 155	[e] 150
Pig iron do	682	678	627
Ferroalloys:			
Ferrosilicon (45-percent basis) do	353	222	229
Ferromanganese do	209	159	224
Ferrosilicomanganese do	147	126	151
Ferrochrome do	39	35	35
Other do	11	12	9
Total do	[r] 759	554	648
Crude steel do	849	870	863
Semimanufactures:			
Rolled products do	607	617	NA
Finished castings do	17	[e] 17	NA
Lead, mine output, metal content	[r] 3,488	3,130	3,094
Magnesium, primary	31,146	35,343	36,455
Molybdenum, mine output, metal content	[r] 356	333	360
Nickel:			
Mine output, metal content	248	[e] 325	[e] 325
Metal, primary	35,601	38,478	41,783
Platinum group (exports) troy ounces	20,544	19,805	28,100
Selenium, elemental	22	26	28
Silicon, elemental (exports)	26,243	26,330	26,648
Titanium:			
Ilmenite concentrate	490,738	578,960	641,602
Dioxide [e]	17,000	17,000	17,000
Vanadium, mine output, metal content [e]	1,010	1,080	1,050
Zinc:			
Mine output, metal content	[r] 11,217	10,596	11,190
Metal, primary	58,775	61,420	62,380
NONMETALS			
Cement, hydraulic thousand tons	2,492	2,635	2,722
Feldspar:			
Lump	128,056	[e] 130,000	[e] 130,000
Ground and other	45,000	[e] 55,000	NA
Fertilizer materials, manufactured:			
Nitrogenous:			
Elemental nitrogen (total) thousand tons	527	519	534
Ammonia do	590	NA	NA
Fertilizers, gross weight do	1,141	NA	NA
Phosphatic do	1	NA	NA
Compound and other do	735	NA	NA
Graphite	9,320	10,385	8,321
Lime (quicklime and hydrated lime)	212,319	[e] 215,000	[e] 220,000
Mica (exports)	3,807	4,306	3,456
Olivine	121,100	132,545	138,000
Pyrite and pyrrhotite:			
Gross weight	766,607	747,044	781,224
Sulfur content	351,559	342,588	358,262
Sand and gravel:			
Sand thousand cubic meters	[e] 4,800	NA	NA
Gravel (including crushed stone n.e.s.) do	[e] 5,000	NA	NA

See footnotes at end of table.

Table 1.—Norway: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971 [p]
NONMETALS—Continued			
Stone:			
Dimension stone:			
Granite	[e] 136,000	NA	NA
Marble	[e] 41,000	NA	NA
Syenite (labrador)	54,557	NA	NA
Slate thousand square meters	401	NA	NA
Crushed and broken stone (unground):			
Dolomite	330,886	348,221	362,838
Limestone thousand tons	5,247	4,826	4,978
Nepheline syenite	129,016	147,044	160,091
Quartz and quartzite	628,661	NA	NA
Sulfur, sulfuric acid (100 percent)	310,284	290,027	289,762
Talc, soapstone, and steatite:			
Unground	67,667	[e] 68,000	[e] 68,000
Other	64,235	[e] 64,000	[e] 64,000
MINERAL FUELS AND RELATED MATERIALS			
Coal, all grades thousand tons	385	465	438
Coke, all grades do	320	311	329
Gas, manufactured million cubic feet	1,083	1,149	1,051
Peat:			
For agricultural use	11,400	[e] 12,000	[e] 12,000
For fuel use [e]	3,600	3,600	3,600
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	4,512	4,994	NA
Jet fuel do	993	1,504	NA
Kerosine do	779	1,232	NA
Distillate fuel oil do	11,420	11,802	NA
Residual fuel oil do	16,053	18,361	NA
Lubricants do	167	202	NA
Other do	2,983	2,218	NA
Refinery fuel and losses do	1,938	2,255	NA
Total do	38,845	42,568	NA

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

TRADE

The value of Norwegian trade in mineral commodities in 1971 was approximately the same as in 1970, although the relative importance of these commodities declined slightly compared with the total value of Norwegian trade. In exports, gains in iron and steel and construction materials offset a decline in value of exported nonferrous metals. In imports, lower total value of imported steel and nonferrous metals was countered mainly by the increased value of imported liquid fuels, even though the quantity of fuel imported in 1971 was substantially less than in the previous year.

Mineral commodity trade in 1969 and 1970 is summarized in the following tables:

Table 2.—Norway: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum including alloys:			
Scrap	6,745	5,313	West Germany 3,695; Sweden 1,071; Netherlands 359.
Unwrought	480,333	429,750	West Germany 143,875; United Kingdom 110,753; Sweden 32,439.
Semimanufactures	25,715	33,980	United Kingdom 16,627; Sweden 7,462; Denmark 3,489.
Cadmium	79	85	NA.
Cobalt	960	720	NA.
Copper:			
Ore and concentrate	35,578	33,552	West Germany 28,404; Sweden 5,148.
Metal including alloys:			
Scrap	1,711	1,477	West Germany 645; Sweden 278; Belgium-Luxembourg 256.
Unwrought:			
Unrefined	5,683	6,376	All to West Germany.
Refined	20,787	26,101	West Germany 13,575; United Kingdom 3,726; France 3,089.
Semimanufactures	3,331	2,659	Sweden 1,910; Denmark 501; Portugal 69.
Gold, unworked or partly worked troy ounces	2,476	2,443	Denmark 1,511; Finland 514.
Iron and steel:			
Ore and concentrate, except roasted pyrite thousand tons	2,732	2,964	West Germany 1,524; United Kingdom 845; Finland 374.
Roasted pyrite	140,384	152,812	West Germany 138,253; Sweden 6,732; Denmark 3,946.
Metal:			
Scrap	37,538	34,975	West Germany 31,305; Sweden 3,614.
Pig iron including cast iron	180,759	149,711	United Kingdom 51,234; West Germany 20,662; Sweden 12,766.
Ferroalloys:			
Ferromanganese	188,118	155,077	West Germany 37,169; United Kingdom 36,504; Belgium-Luxembourg 20,848.
Other	538,875	379,956	West Germany 115,900; United Kingdom 108,718; Belgium-Luxembourg 33,904.
Steel, primary forms	174,815	167,421	Netherlands 80,197; Denmark 55,957; West Germany 20,120.
Semimanufactures:			
Bars, rods, angles, shapes, sections	187,281	187,120	United Kingdom 66,510; Sweden 31,356; West Germany 26,018.
Universals, plates, and sheets	79,529	82,482	Sweden 37,316; Denmark 17,920; United Kingdom 8,505.
Hoop and strip	717	708	Sweden 643; Belgium-Luxembourg 39; Denmark 13.
Rails and accessories	597	883	Sweden 473; West Germany 359; United Kingdom 50.
Wire	8,478	8,976	United Kingdom 1,772; Iraq 1,562; Portugal 1,535.
Tubes, pipes, and fittings	27,201	24,178	Sweden 13,226; Denmark 5,051; United States 913.
Castings and forgings, rough	9,580	13,401	Sweden 9,285; Denmark 1,760; Liberia 1,401.
Total	313,383	317,748	
Lead:			
Ore and concentrate	7,301	6,476	United Kingdom 3,455; West Germany 3,021.
Metal, including alloys:			
Scrap	4,700	4,389	Denmark 2,450; Sweden 1,148; West Germany 787.
Unwrought	364	418	Denmark 279; Sweden 104.
Semimanufactures	40	101	Sweden 85; Denmark 9; Canada 6.
Magnesium metal, including alloys, all forms value, thousands	$19,450	$26,000	NA.
Manganese ore and concentrate	153	945	All to United Kingdom.
Molybdenum ore and concentrate	495	506	NA.
Nickel:			
Ore and concentrate	5,060	6,666	Finland 5,911; West Germany 755.
Metal, including alloys:			
Scrap	202	177	United Kingdom 64; West Germany 53; Netherlands 23.
Unwrought	35,419	37,044	West Germany 6,730; Sweden 6,429; United Kingdom 5,127.
Semimanufactures	204	166	Italy 68; Sweden 39; U.S.S.R. 17.

See footnotes at end of table.

Table 2.—Norway: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS—Continued			
Platinum group and silver:			
Waste and sweepings___kilograms__	39,759	70,568	West Germany 53,803; United Kingdom 12,207; Sweden 3,037.
Metal including alloys:			
Platinum-group metals troy ounces__	20,544	19,837	United States 13,182; United Kingdom 2,733; France 2,186.
Silver_______________do____	322,182	112,142	Denmark 88,704; Sweden 16,268; Singapore 6,430.
Silicon, elemental____________________	26,243	26,288	United Kingdom 8,696; West Germany 8,519; U.S.S.R. 3,758.
Tin including alloys:			
Scrap_________________long tons__	78	14	Denmark 10; Sweden 2; United Kingdom 2.
Unwrought_______________do____	216	225	Sweden 195; Finland 15; Denmark 13.
Titanium ore and concentrate (ilmenite)_	455,238	532,126	NA.
Zinc:			
Ore and concentrate______________	13,668	11,430	Poland 7,134; West Germany 4,296.
Oxide__________________________	444	461	Sweden 357; Finland 37; Denmark 33.
Metal, including alloys:			
Scrap______________________	309	175	Netherlands 46; West Germany 46; Belgium-Luxembourg 42.
Unwrought__________________	46,279	46,254	Sweden 21,611; West Germany 11,105; United Kingdom 6,743.
Semimanufactures____________	324	542	Sweden 175; Netherlands 107; Hong Kong 60.
Other:			
Ash and residues containing nonferrous metals__________________	26,648	22,622	West Germany 8,457; Sweden 6,970; United Kingdom 3,653.
Oxides, hydroxides, and peroxides of metals, n.e.s________________	1,985	2,298	NA.
Base metals including alloys, all forms__________________________	1,043	806	NA.
NONMETALS			
Abrasives (grinding and polishing wheels and stones)_________________	1,483	1,214	Poland 251; Sweden 245; Finland 216.
Cement____________________________	1,089,343	1,022,458	Ghana 447,249; United States 409,818; Ivory Coast 95,157.
Clay products:			
Refractory (including nonclay bricks)_________________________	10,535	8,985	West Germany 5,370; Belgium-Luxembourg 1,275; Finland 688.
Nonrefractory___value, thousands__	$190	$531	West Germany $278; British West Indies $143; United Kingdom $42.
Feldspar and fluorspar________________	198,184	224,068	United Kingdom 58,991; Netherlands 43,800; West Germany 40,244.
Fertilizer materials:			
Manufactured:			
Nitrogenous_________________	981,349	855,332	NA.
Phosphatic__________________	5	16	NA.
Potassic____________________	7	22	NA.
Other______________________	383,773	463,828	NA.
Graphite, natural____________________	8,627	10,620	NA.
Mica, all forms______________________	3,861	4,348	France 1,075; West Germany 783; Sweden 366.
Pyrite (gross weight)_________________	503,803	520,799	West Germany 373,858; Sweden 111,663; United Kingdom 19,032.
Salt_______________________________	3,118	1,717	Sweden 687; Canada 400; Ireland 210.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Marble and other calcareous____________	3,116	3,974	West Germany 1,860; Italy 1,428; Sweden 350.
Slate__________________	50,376	45,082	Netherlands 16,586; Denmark 10,704; West Germany 7,733.
Other__________________	68,148	65,525	France 17,765; West Germany 16,766; Italy 14,796.
Worked, all types____________	393	337	Sweden 97.
Dolomite__________________________	81,198	64,842	Denmark 25,149; Sweden 19,440; Netherlands 10,767.
Gravel and crushed rock__________	776,150	1,013,486	West Germany 672,007; United Kingdom 142,225; Denmark 92,671.
Limestone_________________________	15,515	11,195	Sweden 10,036.
Quartz and quartzite______________	3,452	5,231	United Kingdom 2,330; Denmark 1,326; Netherlands 411.
Sand excluding metal bearing______	230	9,095	Sweden 7,874; Denmark 450; Ivory Coast 420.

See footnotes at end of table.

Table 2.—Norway: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
NONMETALS—Continued			
Sulfur:			
Elemental	18	5	NA.
Sulfur dioxide	4,505	1,989	Sweden 1,890.
Talc, steatite, soapstone, pyrophyllite	63,391	66,375	United Kingdom 16,198; Sweden 10,520; West Germany 9,788.
Other nonmetals n.e.s.:			
Slag, dross and similar waste, not metal bearing	1,402	11,515	Netherlands 9,890; West Germany 1,625.
Other	386	555	West Germany 240.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	144	62	Sweden 60.
Coal and coke, including briquets:			
Anthracite and bituminous coal	62,726	101,644	West Germany 96,778; East Germany 2,467; Sweden 1,228.
Coke and semicoke	63,966	44,705	Peru 12,103; Spain 7,398; Finland 6,149.
Peat, including peat briquets and litter	52	36	NA.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	314	4,141	Denmark 2,889; West Germany 584; Belgium-Luxembourg 339.
Refinery products:			
Gasoline, including natural do	[r] 2,540	1,672	Sweden 835; Denmark 423; Netherlands 219.
Kerosine and jet fuel do	[r] 4	1	NA.
Distillate fuel oil do	[r] 2,552	939	Sweden 790; Denmark 148.
Residual fuel oil do	[r] 6,292	8,218	Sweden 5,364; United Kingdom 1,244; West Germany 702.
Lubricants do	[r] 92	104	Denmark 45; Belgium-Luxembourg 36; Sweden 21.
Mineral jelly and wax do	1	1	Mainly to Sweden.
Other:			
Nonlubricating oils n.e.s. do	125	1	Do.
Liquefied petroleum gas do	217	163	United Kingdom 91; Denmark 35; Netherlands 19.
Pitch and pitch coke do	(1)	19	U.S.S.R. 19.
Bituminous mixtures n.e.s. do	1	1	Mainly to Sweden.
Mineral tar and other coal, petroleum, or gas-derived crude chemicals	18,486	19,885	United Kingdom 11,222; France 4,005; Netherlands 3,067.

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[r] Revised. NA Not available.

[1] Less than ½ unit.

Table 3.—Norway: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum:			
Bauxite	22,323	3,999	Greece 3,574; Guyana 425.
Oxide and hydroxide	988,021	1,014,732	Jamaica 391,665; Surinam 178,417; Guinea 178,310.
Metals including alloys:			
Scrap	53	27	United States 15; Iceland 12.
Unwrought	25,904	23,714	U.S.S.R. 9,575; Sweden 8,168; United States 2,278.
Semimanufactures	16,597	14,106	Belgium-Luxembourg 5,547; Sweden 3,114; United Kingdom 1,312.
Antimony including alloys	71	21	People's Republic of China 20.
Arsenic trioxide, pentoxide and acid	67	82	All from Sweden.
Chromium:			
Chromite	95,274	78,598	Turkey 49,085; U.S.S.R. 16,227; Greece 8,810.
Oxide	152	196	West Germany 140; Poland 21; France 10.
Cobalt:			
Oxide and hydroxide	2	3	Belgium-Luxembourg 2; United Kingdom 1.
Metal including alloys, all forms	5	3	Belgium-Luxembourg 3.
Copper including alloys:			
Scrap	7	152	United States 87; Netherlands 34; West Germany 25.
Unwrought	2,745	1,186	United Kingdom 633; Sweden 524.
Semimanufactures	23,714	28,474	Sweden 10,293; United Kingdom 6,547; Canada 2,744.
Gold, metal worked or partly worked troy ounces	50,316	62,662	United Kingdom 47,165; West Germany 13,664.
Iron and steel:			
Ore and concentrate	47,658	100,615	U.S.S.R. 56,398; Sweden 44,118.
Scrap	20,852	46,112	United Kingdom 19,320.
Pig iron, ferroalloys, and similar materials	27,812	18,627	Finland 5,501; Sweden 3,713.
Steel, primary forms	73,670	92,416	Netherlands 80,975; Belgium-Luxembourg 4,518; Sweden 2,884.
Semimanufactures:			
Bars, rods, angles, shapes and sections	273,990	307,279	West Germany 74,021; France 48,683; Belgium-Luxembourg 43,443.
Universals, plates, and sheets	540,666	649,582	West Germany 133,629; United Kingdom 108,444; Japan 96,121.
Hoop and strip	76,375	85,476	Belgium-Luxembourg 38,876; United Kingdom 16,792; West Germany 9,874.
Rails and accessories	10,836	13,631	Sweden 7,949; United Kingdom 3,404; Austria 857.
Wire	9,637	10,010	Belgium-Luxembourg 3,989; West Germany 2,036; United Kingdom 1,580.
Tubes, pipes, and fittings	76,937	86,394	West Germany 31,004; United Kingdom 19,387; Sweden 14,501.
Castings and forgings, rough	793	1,172	United Kingdom 365; Sweden 288; Finland 166.
Total	989,234	1,153,544	
Lead:			
Oxides	1,656	1,989	Sweden 1,025; United Kingdom 605.
Metals including alloys:			
Scrap	125	197	Sweden 126; Denmark 61.
Unwrought	10,686	11,138	United Kingdom 6,800; Sweden 1,408; Denmark 1,316.
Semimanufactures	1,204	1,236	Netherlands 480; Belgium-Luxembourg 303; France 154.
Magnesium metal including alloys, all forms	552	593	West Germany 410; Sweden 106; Denmark 43.
Manganese:			
Ore and concentrate	627,025	544,709	Brazil 158,624; Ghana 122,248; Republic of South Africa 88,621.
Oxides	446	695	Netherlands 502; Japan 105; Belgium-Luxembourg 39.
Mercury 76-pound flasks	986	870	Yugoslavia 435; Italy 145; United Kingdom 87.
Molybdenum metal including alloys, all forms	2	--	

Table 3.—Norway: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS—Continued			
Nickel:			
Matte, speiss, and similar materials	69,837	94,575	Canada 94,458; Republic of South Africa 112.
Metal, including alloys:			
Scrap	668	244	United Kingdom 229; Sweden 15.
Unwrought	156	152	United Kingdom 148.
Semimanufactures	303	308	West Germany 135; United Kingdom 95; Sweden 37.
Platinum group and silver:			
Waste and sweepings...kilograms	12,691	3,850	Switzerland 2,685; Denmark 1,163.
Metal including alloys:			
Platinum group..troy ounces	7,330	2,764	United Kingdom 1,897.
Silver..thousand troy ounces	3,767	4,105	United Kingdom 2,509.
Tin including alloys:			
Scrap...long tons	33	107	Sweden 77; Belgium-Luxembourg 30.
Unwrought...do	605	625	United Kingdom 392; Netherlands 134; Denmark 55.
Semimanufactures...do	488	585	United Kingdom 479; Netherlands 59; West Germany 34.
Titanium:			
Ore and concentrate	138	264	Australia-Samoa 193.
Dioxide	1,859	1,294	West Germany 1,048; United Kingdom 137.
Tungsten, metal including alloys, all forms	2	2	All to United Kingdom.
Zinc:			
Ore and concentrate	103,362	147,971	Sweden 87,355; Australia-Samoa 45,414; Canada 15,202.
Oxide	1,195	1,627	East Germany 973; Poland 270; West Germany 194.
Metal including alloys:			
Scrap	3,706	2,913	Sweden 1,381; Denmark 1,091; France 400.
Unwrought	4,645	2,070	Finland 902; France 601; Poland 464.
Semimanufactures	1,051	930	Belgium-Luxembourg 475; West Germany 187; United Kingdom 107.
Other:			
Ore and concentrate	231	754	Australia-Samoa 595.
Ash and residues containing nonferrous metals	608	171	Sweden 169.
Oxides, hydroxides and peroxides of metals n.e.s	431	338	Finland 122; United Kingdom 97; West Germany 81.
Metals, including alloys, all forms:			
Metalloids	18	143	Sweden 137.
Alkali, alkaline-earth, and rare-earth metals	51	43	United Kingdom 40; France 3.
Pyrophoric alloys	4	3	Australia-Samoa 1; United Kingdom 1; United States 1.
Base metals including alloys, all forms n.e.s	550	422	Republic of South Africa 310; U.S.S.R. 30.
NONMETALS			
Abrasives:			
Pumice, emery, natural corundum	549	1,101	West Germany 774; Netherlands 124; Italy 84.
Grinding and polishing wheels and stones	733	736	United States 194; Austria 131; Sweden 125.
Asbestos	6,945	7,982	Canada 4,441; U.S.S.R. 3,059; Republic of South Africa 192.
Barite and witherite	16,304	20,795	Italy 10,082; Ireland 7,915; Morocco 1,266.
Boron materials:			
Crude natural borates	815	1,195	All to United States.
Oxide and acid	349	345	United States 304; West Germany 7.
Cement	25,889	19,829	Denmark 18,404; Sweden 922.
Chalk	8,921	10,263	France 4,054; Denmark 3,470; Sweden 2,013.
Clays and products:			
Crude:			
Fuller's earth, dinas, chamotte	1,245	1,188	United Kingdom 865; United States 171; France 76.
Kaolin	87,120	80,399	United Kingdom 78,298; United States 1,249; Czechoslovakia 540.
Other	46,802	62,517	United Kingdom 38,035; Italy 6,688; Czechoslovakia 5,164.
Products:			
Refractory	28,693	36,390	Sweden 15,757; West Germany 6,507; Denmark 3,970.
Nonrefractory value, thousands	$3,269	$3,454	Sweden $819; Netherlands $766; Denmark $513.

Table 3.—Norway: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
NONMETALS—Continued			
Cryolite and chiolite	4,374	4,287	All to Denmark.
Diamond:			
Gem not set or strung ..... carats	250,000	375,000	West Germany 235,000; Denmark 35,000; Japan 30,000; U.S.S.R. 30,000.
Industrial ..... do	--	15,000	NA.
Diatomite and other infusorial earths	3,768	2,421	Denmark 956; United States 875; Iceland 180.
Feldspar	15	5	NA.
Fertilizer materials:			
Crude:			
Nitrogenous	223	171	West Germany 121; Poland 50.
Phosphatic	281,685	369,184	U.S.S.R. 196,687; United States 110,668; Morocco 58,395.
Manufactured:			
Nitrogenous	761	598	West Germany 250; Austria 195; Belgium-Luxembourg 147.
Phosphatic	6,683	16,650	Sweden 16,372; Netherlands 273.
Potassic	202,555	223,626	Spain 105,109; France 85,829; West Germany 20,677.
Other	75	7,238	Sweden 7,171; West Germany 25.
Ammonia	66,067	40,849	All from the United States.
Fluorspar	2,295	24,967	United Kingdom 8,812; Italy 8,024; Spain 4,755.
Graphite, natural	390	395	United Kingdom 175; West Germany 107; Sweden 101.
Gypsum and plasters	140,582	192,203	Poland 110,774; France 79,114; West Germany 1,592.
Lime	18,085	19,829	Denmark 18,404; Sweden 922; Poland 271.
Magnesite	5,516	4,963	People's Republic of China 3,171; Austria 1,058; United Kingdom 277.
Mica, all forms	3,807	4,462	India 3,163; Brazil 600; Republic of South Africa 596.
Pigments, mineral:			
Natural crude	426	352	Sweden 128; West Germany 115; United States 30.
Iron oxides processed	2,096	2,180	West Germany 2,020; United Kingdom 90; Spain 49.
Precious and semiprecious stones, except diamond including synthetic stone, dust and powder ..... kilograms	424	708	West Germany 619; United Kingdom 18; Denmark 13.
Salt and brine	309,098	339,592	Netherlands 156,977; West Germany 43,275; Italy 41,875.
Sodium and potassium compounds:			
Caustic soda	20,616	22,298	Netherlands 12,795; France 4,747; Italy 1,911.
Caustic potash, sodic and potassic peroxides	1,306	1,021	West Germany 520; Sweden 286; France 159.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous	245	578	Sweden 227; Italy 219; People's Republic of China 110.
Slate	3,160	4,210	Sweden 4,170; East Germany 39.
Other	2,428	1,315	Sweden 832; East Germany 341.
Worked, all types	1,221	1,532	Portugal 590; East Germany 291; People's Republic of China 262.
Dolomite	2,335	2,898	West Germany 1,086; Sweden 1,032; United Kingdom 607.
Flint	954	1,025	Denmark 620; United Kingdom 350.
Gravel and crushed rock	36,332	44,376	Sweden 40,858; Belgium-Luxembourg 1,321; Denmark 760.
Limestone	279,058	319,705	United Kingdom 307,835; Denmark 10,013.
Quartz and quartzite	100,490	172,745	Spain 84,381; Portugal 42,130; Sweden 40,779.
Sand excluding metal bearing	155,870	166,147	Belgium-Luxembourg 92,877; Sweden 32,836; Netherlands 22,613.
Sulfur:			
Elemental	34,464	34,006	Poland 20,805; France 10,617; United States 1,926.
Sulfuric acid	881	1,062	Sweden 985; Netherlands 47; West Germany 15.
Talc, steatite, soapstone and pyrophyllite	8,034	2,766	United States 1,625; Austria 398; People's Republic of China 258.

See footnote at end of table.

Table 3.—Norway: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
NONMETALS—Continued			
Other, n.e.s.:			
Crude	53,018	63,844	West Germany 54,983; East Germany 6,428; Sweden 1,841.
Slag, dross and similar waste, not metal bearing	63,367	70,671	Sweden 46,645; France 16,700; Finland 4,975.
Oxides and hydroxides of magnesium, strontium, and barium	190	266	France 90; United Kingdom 61; Belgium-Luxembourg 45.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	370	459	United States 443.
Carbon black and gas carbon	4,279	4,577	Sweden 1,731; United Kingdom 1,025; Netherlands 602.
Coal, all grades, including briquets thousand tons	553	464	United States 166; United Kingdom 136; Poland 123.
Coke, all types do	727	840	United Kingdom 627; West Germany 79; France 31.
Gas, hydrocarbon	5,298	5,992	Sweden 2,531; United Kingdom 1,982; Denmark 1,227.
Peat including peat briquets and litter	3,333	4,353	Sweden 4,226; Finland 77.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	37,758	47,787	Muscat-Oman 10,635; Venezuela 8,555; Nigeria 8,188.
Refinery products:			
Gasoline (including natural) do	4,953	5,226	United Kingdom 1,486; U.S.S.R. 1,092; Bahrain 783.
Kerosine and jet fuel do	2,040	2,485	United Kingdom 1,469; Belgium-Luxembourg 394; Netherlands 273.
Distillate fuel oil do	8,782	10,576	United Kingdom 3,940; Netherlands 1,418; U.S.S.R. 1,335.
Residual fuel oil do	7,311	8,496	United Kingdom 4,459; Sweden 1,371; U.S.S.R. 912.
Lubricants do	413	448	United Kingdom 165; Sweden 99; Denmark 92.
Mineral jelly and wax do	49	52	West Germany 33; U.S.S.R. 6; United Kingdom 4.
Other:			
Nonlubricating oils, n.e.s. do	16	15	United Kingdom 4; Sweden 3; United States 2.
Pitch and pitch coke do	480	529	United Kingdom 307; West Germany 204.
Petroleum coke do	1,478	1,783	United States 1,678; United Kingdom 73.
Bitumen and other residues do	665	888	Netherlands Antilles 429; Denmark 194; West Germany 132.
Bituminous mixtures, n.e.s do	17	15	United Kingdom 6; Denmark 4; Sweden 2.
Total do	23,204	30,513	

NA Not available.

COMMODITY REVIEW

METALS

Aluminum.—A weakening world market for aluminum, caused by a slowdown in growth of demand and conditions of oversupply, led to cutbacks in primary aluminum production by most Norwegian producers in 1971. However, total production was almost unchanged from the 1970 level, exports declined only slightly, and production capacity increased by about 100,000 tons during the year. The deterioration of the market caused some producers to announce further cutbacks in production for 1972.

The competitive position of the Norwegian aluminum industry was further affected in 1971 by the commissioning of three primary smelters in the United Kingdom. This raised primary production capacity in Britain to about 300,000 tons, a nearly eight-fold increase. The United

Kingdom has been a major export market for Norwegian aluminum. Also, the expansion of primary capacity in the Common Market countries and the United Kingdom in 1971 was reported to have reduced Norway's share of West European capacity from 27 percent to 22 percent by yearend.

Construction of new facilities and modernization of others during 1971 raised total Norwegian production capacity for primary metal to about 685,000 tons annually. The new smelter of Mosjøen Aluminium A/S at Lista began production in February, and completion of a second potline in the fall doubled the plant's capacity to 50,000 tons. A/S Årdal og Sunndal Verk (ASV) rebuilt older plants at Årdal, increasing capacity by about 50,000 tons. A/S Alnor continued to expand its smelter on Karmøy, raising capacity from 80,000 tons to about 105,000 tons by yearend. Further increases were expected at the ASV and Alnor facilities in 1972. Average utilization of capacity for all Norwegian smelters during 1971 was reportedly about 88 percent.

Production of aluminum semimanufactures in Norway in 1971 was estimated at 70,000 tons, about 13 percent of primary output. Exports rose slightly, to 36,000 tons, but the weak price situation allowed foreign producers to compete more effectively in the Norwegian market and imports of ingot and semimanufactures increased to 52,000 tons, about 37 percent more than in 1970.

Copper.—Increased output of mine copper in 1971 was primarily due to production from the Bidjovagge mine in Finnmark. Opened in late 1970, the mine produced 81,400 tons of crude ore and 6,320 tons of copper concentrate in 1971. Production was expected to more than double in 1972.

Grong Gruber A/S continued to develop the Joma copper-zinc deposit at Røyrvik in Nord-Trøndelag. Production was expected to start in the summer of 1972, at the rate of 250,000 tons of crude ore, 18,000 tons of copper concentrate, and 4,000 tons of zinc concentrates per year.[2] About 100 men will be employed, with the mine operated on a two-shift basis and the flotation plant on three shifts.

At Repparfjord, north of 70° latitude, construction of the copper mine and concentrator by Folldal Verk A/S was ahead of schedule and production may begin by the summer of 1972. Mining will apparently be done by open pit methods, with the ore dropped through a shaft to an underground crushing station. The operation is expected to annually produce 1.5 million tons of waste rock, 600,000 tons of crude ore, and 13,000 to 15,000 tons of copper concentrate containing 30 to 33 percent copper. The crushing and concentration plants will be extensively automated.

The Tverfjellet and Sulitjelma mines remained the principal producers of copper concentrates in 1971, together accounting for 73 percent of the national output. These mines also produced about 40 percent of Norway's output of pyrite and 30 percent of the mine zinc. The Sulitjelma smelter produced 6,500 tons of blister copper in 1971, almost all of which was exported. Exports from Norway during the year also included 40,000 tons of copper concentrates and 28,000 tons of refined copper. The refined metal was produced from matte imported from Canada by Falconbridge Nikkelverk A/S.

Elkem A/S, which owns the Sulitjelma operation and produces copper-bearing pyrites at the Skorovas mine, indicated that the average price of copper on the world market in 1971 was 24 percent lower than in 1970.

Iron Ore.—Production and exports of iron ore in 1971 declined slightly compared with the previous year. Exports of unagglomerated concentrate fell by 14 percent to 1,526,000 tons, while exports of iron ore pellets increased 3 percent to 1,214,000 tons. The average value of concentrate exported in 1971, as calculated from Norwegian export statistics,[3] was equivalent to approximately $8.60 per ton, an increase of about 14 percent over the comparable figure for 1970. The value of exported pellets was not stated.

A/S Sydvaranger remained the largest Norwegian producer of iron ore, accounting for about 60 percent of the national output and 85 percent of total exports in 1971. While the company's production and shipments of iron ore were less than in 1970, contracted prices were higher and the total value of ore sales increased by about 8 percent in 1971. During 1971, A/S

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[2] Previously reported in Minerals Yearbook for 1970 as 20,000 tons of copper concentrate and 5,000 tons of zinc concentrate per year.

[3] Statistisk Sentralbyrå (Oslo). Månedsstatistikk over Utenrikshandelen (Monthly Statistics of Foreign Trade), December 1971, p. 30.

Sydvaranger produced 2,324,000 dry tons of concentrate averaging 66.1 percent iron from 5,797,000 dry tons of crude ore averaging 31 percent iron. Approximately 48 percent of the concentrate was pelletized. Iron ore shipments by the company in 1971 were as follows (in thousand dry tons):

Destination	Concentrate	Pellets	Total
West Germany	710	702	1,412
United Kingdom	314	407	721
Norwegian consumers [e]	111	3	114
Total	1,135	1,112	2,247
Average moisture content as shipped percent	6.69	.69	--

[e] Estimate.

Source: Bergverks-Nytt (Trondheim). V. 19, No. 4, April 1972; pp. 9–10.

The Rødsand mine, owned by Christiania Spigerverk (CS), produced 144,100 tons of vanadium-bearing magnetite concentrate and 8,200 tons of ilmenite concentrate in 1971 from 670,800 tons of crude ore. The magnetite concentrate is normally used by the company to produce pig iron and ferrovanadium at Svelgen. Exploration of a new and deeper underground ore body at the Rødsand mine in 1971 was reported to have yielded favorable results. In southern Norway, the Bråstad underground mine, operated by the same company, produced about 25,000 tons of direct shipping lump ore and concentrate in 1971. Beginning in 1972, the lump ore at Bråstad (containing about 50 percent iron) will be processed to yield a high-grade (68 percent iron) concentrate.

Shipping facilities at Kirkenes were improved by the Sydvaranger Co. in 1971. Ore loading capacity was increased to 4,000 tons per hour, and the port can now accommodate iron ore carriers of up to 150,000 deadweight tons (d.w.t.). The company also planned to start construction of a second pelletizing plant early in 1972. The new plant will have a production capacity of 1.5 million tons of pellets per year and is scheduled for completion in 1974. Cost of the plant is estimated at about $20 million. Design and construction will be handled by Allis Chalmers of Milwaukee, Wis., and Krupp Industriebau of West Germany.

The port of Narvik, from which most Swedish exports of iron ore are shipped, was scheduled for expansion. The first phase of the project will provide ore loading at the rate of 10,000 tons per hour and berthing facilities for vessels of up to 150,000 d.w.t. Eventually, the ore loading rate may be increased to 20,000 tons per hour, with berthing for 300,000-d.w.t. vessels. Consulting engineering for the project was awarded in 1971 to Soros Associates of New York, N.Y.

Ferroalloys.—Gains in output and exports of ferroalloys in 1971 were mostly confined to manganese grades. Reduced demand from foreign producers of steel kept the total volume of exports at the 1970 level of 534,000 tons, although total value increased 5 percent to approximately $105 million. Imports of manganese ore rose to 736,000 tons in 1971, while imports of chromite increased slightly to 82,000 tons.

In mid-1971 a large new ferrosilicon furnace was started up at Svelgen, by Bremanger Smelteverk, a division of Christiania Spigerverk. The furnace has a transformer capacity of 51,000 kilovolt-amperes (kv.-a.) and a production capacity of about 30,000 tons of ferrosilicon per year.

Tinfos Jernverk planned to construct a large ferromanganese smelter at Kvinesdal. The plant will be built in two stages, each involving one 30,000-kv.-a. furnace, and is to be completed by 1975. The company will then concentrate its production of ferrosilicon at Notodden.

Two new furnaces for production of silicon metal were expected to start operating in early 1972. One furnace was being installed by Bremanger Smelteverk and will raise production capacity at Svelgen to more than 10,000 tons of silicon per year. The other furnace was being completed by A/S Meraker Smelteverk, a subsidiary of Union Carbide Corp., and will have a production capacity of 14,000 tons per year.

Exports of silicon in 1971 totaled 26,600 tons, about the same as in 1970.

Iron and Steel.—The drop in output of pig iron in 1971 was not accompanied by an equivalent reduction in output of crude steel. The decline appeared to be due to a shutdown of one of the electric furnaces operated by A/S Norsk Jernverk at Mo–i–Rana.

Exports of pig iron declined to 127,000 tons in 1971. Imports of rolled steel also fell, but exports of slabs and other crude forms, bars and sections, and plates increased, so that in 1971 net imports of steel were 166,000 tons less than in 1970.

However, the value of imports was higher and the net trade deficit attributable to rolled steel increased by about $7 million.

Lead and Zinc.—Production and exports of lead and zinc concentrates in 1971 were close to the levels of 1970. Increased mine production was expected in 1972, due to the new mine being opened by A/S Grong Gruber and expansions of crude ore production at the Bleikvassli, Mofjellet, and Tverfjellet mines. A new ore body being developed at the Mofjellet mine was reported to contain enough ore for 15 years' production. Output of crude ore at Mofjellet in 1971 was approximately 100,000 tons.

The Eitrheim smelter produced a record quantity of zinc in 1971, although imports of zinc concentrates appeared to be the lowest in several years. Norwegian exports of unwrought zinc, including alloys, totaled 48,500 tons in 1971.

Mercury.—A method of analyzing rocks and minerals for trace quantities of mercury was developed at the Central Institute of Industrial Research in Oslo for use in geochemical prospecting. The method was said to permit determination of mercury concentrations down to 0.01 part per million. In connection with this work, the mercury content of samples of sulfide ores and concentrates from various Norwegian mines was determined. Some of the results were as follows:

Mine	Mercury content (parts per million)				
	Crude ore	Type of sulfide concentrate			
		Pyrite	Copper	Zinc	Lead
Folldal	1.4	0.2	4.8	56.5	(1)
Sulitjelma	1.9	1.8	1.0	63.8	(1)
Løkken	1.2	2.6	(1)	(1)	(1)
Killingdal	3.6	18.6	9.1	40.4	(1)
Mofjell	5.3	.8	8.4	45.8	7.9
Olavsgrubene	4.8	[2] 1.0	2.7	(1)	(1)

[1] Not produced or not analyzed.
[2] Pyrrhotite.

Source: Bergverks-Nytt (Trondheim). V. 18, No. 12, December 1971, pp. 18–19.

Molybdenum.—The modernization program at the Knaben mine, reportedly in progress for the last several years, appeared to be nearing completion in 1971. Production and exports of molybdenite concentrate increased about 10 percent compared with 1970, and similar increases were expected in 1972. Production planned for 1972 was 400,000 tons of crude ore and 550 tons of concentrate.

Nickel, Cobalt, and Platinum-Group Metals.—The only reported mine production of nickel continued to be byproduct concentrate obtained from the processing of ilmenite ore at Tellnes, by A/S Titania. Production of these concentrates has steadily increased since 1967, reaching 8,000 tons in 1971. Exports totaled 8,212 tons in 1971, valued at approximately $600,000. The concentrates are usually exported to Finland.

Nickel, cobalt, and platinum-group metals were produced at Kristiansand from imported Canadian matte by Falconbridge Nikkelverk A/S. Imports of matte (100,000 tons) and production and exports of refined metal reached record levels in 1971. Exports of unwrought metal included 40,000 tons of nickel, 762 tons of cobalt, and 28,100 troy ounces of platinum-group metals with an aggregate reported value of about $121 million.

Titanium.—Increasing output of ilmenite concentrate was due to the continuing expansion of mine and plant facilities at Tellnes by A/S Titania. The company produced 2.06 million tons of crude ore and 641,602 tons of ilmenite concentrate in 1971, about 11 percent more than in 1970, and continued to recover byproduct concentrates of iron and nickel. Twenty 300-cubic-foot Wemco-Fagergren flotation cells were ordered by the company during 1971; installation of these machines is expected to raise the throughput capacity of the plant to the planned level of 3 million tons of crude ore per year.

Exports of ilmenite declined slightly in 1971 to 514,000 tons although the total value (approximately $5.3 million) was about 9 percent more than in 1970. Exports of titanium dioxide and titanium-white, most of which were probably manufactured by Titan A/S, were valued at about $6.2 million or 4 percent more than in 1970. Both companies were subsidiaries of NL Industries, Inc. (formerly National Lead Co.). The name of Titan A/S was changed to Kronos Titan A/S at yearend.

NONMETALS

Cement and Other Construction Materials.—The steadily rising production of cement was accompanied in 1971 by increased activity in the domestic construction industry and a 20-percent increase in the volume of exports. The number of buildings started and under construction was 10 to 15 percent greater than in 1970, and the number of buildings completed was about 7 percent higher. Exports of cement rose to 1.2 million tons, with a total value 30 percent higher than in 1970. Imports of gypsum were up 13 percent.

The United States is one of the major destinations of Norwegian cement. The exporting company, A/S Norcem, was building two new storage silos in New York City in 1971, increasing its storage capacity there to 32,000 tons.

Exports of unfinished dimension stone totaled 114,000 tons, about the same as in 1970, although total value increased 4 percent to about $9 million. The exports consisted mainly of syenite (labrador) and slate, with smaller quantities of granite and marble.

Nepheline Syenite.—All output of nepheline syenite continued to be produced on the island of Stjernøy by A/S Norsk Nefelin, a division of Christiania Spigerverk. The company sold 151,700 tons of finished products in 1971, of which about 88 percent consisted of "glass-grade" material; the remainder was of "ceramic grade." Almost the entire quantity was exported to 12 countries. Average f.o.b. sales value of the products in 1971 was about 6 percent higher than in 1970. The company was completing a new crushing and drying plant which is expected to raise production capacity to 225,000 tons per year in March 1972.

Pyrite.—The record output of pyrite in 1971 was mainly due to increased production at the Skorovas, Folldal, and Løkken mines. At Løkken, a 20-percent increase in output was planned by Orkla Grube-Aktiebolag in 1972.

Norwegian exports of pyrite, including cupriferous pyrite, increased slightly in 1971 to 523,000 tons, but owing to declines in world prices for sulfur and copper the total value was 33 percent less than in 1970.

Talc, Steatite, and Other Nonmetals.—Exports of ground talc and steatite totaled 71,500 tons in 1971, about 10 percent more than in 1970. The increase appeared to reflect rising production by A/S Norwegian Talc, whose plant at Knarrevik was destroyed by fire in 1969. The company reported gross production of 515,000 tons of talc, dolomite, mica, feldspar, and other materials in 1971, including 130,000 tons for fine grinding; this compared favorably with 1970 figures of 450,000 tons and 105,000 tons, respectively. Dolomite milling was resumed in the summer, and the plant was apparently completely rebuilt by yearend. A rapid increase in production was not expected, due to delays in recovering some of the markets lost after the fire.

Elsewhere, deposits of quartz, mica, and kyanite were being evaluated for commercial production near Bolna, close to the Swedish border. Drilling of the quartz deposits was completed by fall, and beneficiation tests of kyanite-bearing materials were reportedly favorable.

MINERAL FUELS

Coal and Coke.—Production of coal on Spitzbergen Island was less than planned in 1971, apparently because there were not enough miners available in the fall of the year. Shipments of coal in 1971 included approximately 245,000 tons to A/S Norsk Koksverk at Mo-i-Rana, and 60,000 tons to West Germany. Total exports of coal were about 84,000 tons, 17 percent less than in 1970. Imports of coal totaled 451,000 tons.

Imports of coke (from coal) in 1971 totaled 615,000 tons, 27 percent less than in 1970. Imports of petroleum coke also declined, to 280,000 tons.

Plans to increase coke production capacity at Mo-i-Rana may have been dropped. The Norwegian Ferrosilicon, Producers Association was reported to have applied for a concession in north Norway for a coking plant at Finnsnes.

Petroleum.—*Exploration.*—An important gasfield was found in 1971 by A/S Petronord. The gasfield, known as the Frigg field, is located about 200 kilometers northwest of Karmøy, close to the boundary between the Norwegian and British sectors of the

North Sea. Although neither production potential nor reserves was announced, the field was reported to be of commercial size.

Drilling by the Phillips Petroleum Co. in 1971 confirmed that the Torfelt structure, where oil was discovered in 1970 by the Amoco-Noco group, extends into the Phillips concession area. The information well flowed 3,460 barrels of oil per day.

A/S Norske Shell announced that it will resume drilling in the North Sea in February 1972. Previously, the company had drilled five dry holes.

In the Svalbard archipelago, Total Marine Norsk was drilling an exploration hole in 1971 on the northern part of Edge Island (Edgeøya). A fire during the winter forced suspension of operations, but drilling was planned to resume in 1972. Total Marine, owned by Compagnie Française des Pétroles, is the operating company for the Texaco-Socal group which includes Texas Overseas Petroleum Co. and California Asiatic Oil Co. This group holds large areas of Edge Island under claim and is also the principal claimholder on Spitzbergen Island. Other claimholders include Norske Fina A/S, Norsk Polar Navigasjon A/S, and the Soviet firm Arktikugol.

The latter two companies carried out seismic surveys and performed core drilling on Hopen Island (south of Edge Island) in 1971. The same group planned to drill in the Plurdalen area of Edge Island in 1972.

Production.—Production of crude oil from the Ekofisk field was begun by Phillips Petroleum Co. in mid-1971. By year-end four wells were producing a total of about 40,000 barrels per day. Oil was loaded directly into tankers; a million-barrel storage tank will be installed by 1973 to minimize interruptions in production due to bad weather. The field will be developed for additional production in 1973: the full development program is designed to yield 300,000 barrels per day by late 1974. Three other fields are expected to be eventually tied into the system. The Phillips Co. has a 37-percent interest in this development, along with Norske Fina A/S (30 percent), Norske Agip A/S (13 percent), and seven other companies (20 percent).

In a report to the Norwegian Government, the Ekofisk Committee estimated recoverable hydrocarbon reserves in the Norwegian sector of the North Sea, as follows (quantities are in million units unless otherwise indicated):

Field	Oil (barrels)	Gravity (° API)	Natural gas (cubic meters)	Natural gas liquids (barrels)
Ekofisk	1,000	35.3 °	99,150	140
West Ekofisk	340	43.0 °	71,671	177
Tor	109	40.0 °	7,365	19
Cod	18	50.0 °	20,028	32
Total	1,467	--	198,214	368

Imports, Refining, and Consumption.—Imports of crude oil in 1971 totaled 5.6 million tons, 14 percent less than in 1970. The decline was partly due to initial production of crude oil from the Ekofisk field, which was being processed by A/S Norske Shell's refinery at Risavika. Imports of petroleum products declined 5 percent to 4.1 million tons, but exports of products increased by 13 percent to 1.8 million tons.

Norsk Hydro-Elektrisk Kvaelstofaktieselskab (Norsk Hydro), Norway's largest industrial concern and a major consumer of petroleum products, planned to build a petroleum refinery 37 miles north of Bergen, at Mongstad. The refinery will have a processing capacity of 4 million tons of crude oil per year and will be completed by 1975. Forty percent of the venture will be owned by Norsk Braenselolje A/S, an oil distributing company owned 50 percent by British Petroleum and 50 percent by Norwegian stockholders.

Domestic consumption of refinery products in 1970 and 1971 was as follows (quantities in thousand metric tons):

Refinery product	1970	1971[1]
Aviation fuels	238	240
Gasoline	955	1,000
Kerosine	364	360
Gas/diesel oil	2,603	2,700
Residual fuel oil	2,445	2,100
Other	828	800
Total	7,433	7,200

[1] Estimate based on quantities reported for the first three quarters of 1971.

Source: Organization for Economic Cooperation and Development (Paris). Provisional Oil Statistics by Quarters. 3rd Quarter, 1971, 21 pp.

The Mineral Industry of Pakistan (Including Bangladesh)

By Benjamin Petkof[1]

The mineral industries of Pakistan continued to make only minor contributions to the overall economy. East Pakistan became the nation of Bangladesh during the year. Natural gas production from the Dhulian, Māri, and Sui Fields in Pakistan and the Chhatak, Habigan, Titus, and Sylhet fields in Bangladesh supplied the major mineral based contribution to the economy of both countries. Natural gas is expected to maintain its position as the leading item of mineral output. Minerals and related products such as chromite, cement, gem stones, gypsum, salt, and stone have been exported in sufficient quantities to generate valuable foreign exchange for both countries. However, large sums of foreign exchange have also been expended for the importation of iron and steel, fertilizer materials, crude petroleum and partially or fully refined petroleum products.

Plans for improving railroad facilities in Balachistan were under consideration by the West Pakistan Railway Board during 1971. These improvements would reduce the transit time required to move chrome ore from the Kindubah mine to the coast. Consideration was also given to additional facilities required to transport dolomite for the anticipated steel mill complex near Karachi.

According to Pakistan Government sources, the extraction of crude minerals contributed $44.3 million[2] in current dollars to Pakistan's gross national product (GNP) of $16,215.6 million for the fiscal year ending June 30, 1971 (comparable figures for the previous fiscal year were $42 million and $15,525.9 million respectively). Value added data, resulting from processing both domestic and imported mineral commodities were not available, but the figure is much greater than the value of the crude minerals extracted. Pakistan's petroleum operations alone earn for the Government several hundred million dollars per year from duties and other special surtaxes.

PRODUCTION

As of July 1, 1970, the Pakistan Government began reporting some mineral production data on a provincial basis. Thus, certain mineral items previously unreported began to appear in official statistical reports. For the first time production of feldspar, fluorspar, and manganese ore in the Province of Baluchistan and sulfur in the Northwest Frontier Province has appeared in official records. More details of production may be expected in the future.

Mineral production in Pakistan remained strong during 1971 with major commodities such as chromite, salt, coal, and natural gas showing only small variation from the 1970 output. Other minerals such as bauxite, barite, and chalk showed marked declines in production.

The mineral output of Bangladesh was small because known resources are limited and are not greatly developed. Natural gas remained the Nation's major mineral product.

The production of processed mineral commodities such as cement and soda ash continued to increase and to be consumed largely by other domestic industries.

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[1] Physical scientist, Division of Nonmetallic Minerals.

[2] Where necessary, values have been converted from Pakistani Rupees (PRs) to U.S. dollars at the rate of PRs 4.7619=US$1.00.

Table 1.—Pakistan (including Bangladesh):[1] Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [2]	1969	1970	1971 [p]
PAKISTAN (FORMERLY WEST PAKISTAN)			
METALS			
Aluminum, bauxite, gross weight	2,213	795	[e] 150
Antimony ore:			
Gross weight [e]	NA	150	250
Metal content [e]	NA	30	50
Arsenic ore (orpiment), gross weight kilograms	NA	305	NA
Chromium, chromite, gross weight	[r] 16,724	29,084	[e] 27,500
Iron and steel, mild steel products [3] thousand tons	192	174	[e] 200
Lead ore:			
Gross weight	------	6	[e] 16
Metal content [e]	------	3	8
Manganese ore, gross weight	81	12	[e] 60
NONMETALS			
Abrasives, natural, emery stone	NA	[e] 2,900	345
Barite	6,766	[e] 3,100	[e] 2,500
Cement, hydraulic thousand tons	2,618	2,571	2,621
Chalk [e]	NA	1,160	900
Clays:			
Bentonite [e]	NA	600	140
Fire	21,651	28,281	[e] 27,000
Fuller's earth [e]	9,000	13,000	12,200
Kaolin (china) [e]	NA	11,600	3,700
Other [e] [4]	NA	70,000	50,000
Feldspar [e]	NA	280	280
Fertilizer materials manufactured:			
Nitrogenous:			
Gross weight [5]	[r] 231,252	263,590	[e] 272,000
Nitrogen content [5]	[r] 95,641	107,993	[e] 111,000
Phosphatic, gross weight	17,268	23,308	[e] 26,000
Fluorspar [e]	NA	1,060	5,300
Gypsum, crude	[r] 277,382	167,522	[e] 124,000
Magnesite, crude [e]	1,100	1,000	220
Natron manufactured (soda ash)	[r] 61,976	74,257	[e] 81,000
Pigments, natural mineral, ocher	659	[e] 4,125	276
Salt:			
Rock thousand tons	356	316	[e] 355
Marine evaporated do	[r] 263	221	266
Total do	[r] 619	537	621
Sand and gravel:			
Gravel	NA	[e] 60,000	[e] 71,000
Sand:			
Bajri [6]	NA	[e] 7,500	[e] 8,600
Glass [7]	46,441	[e] 36,000	[e] 70,000
Common [7]	NA	[e] 43,000	[e] 27,000
Stone:			
Aragonite	15,816	22,430	[e] 12,000
Dolomite	1,046	[e] 2,000	[e] 2,900
Limestone thousand tons	2,768	[e] 2,400	[e] 2,570
Marble	NA	[e] 530	[e] 4,000
Crushed [7] [8]	NA	[e] 24,000	[e] 52,000
Strontium minerals, celestite	772	[e] 300	[e] 230
Sulfur [9]	NA	[e] 2,000	[e] 2,400
Talc and related materials, soapstone	[r] 2,188	[e] 3,500	[e] 4,700
MINERAL FUELS AND RELATED MATERIALS			
Coal, all grades [e] thousand tons	[r] 1,260	1,270	1,250
Gas, natural, sales million cubic feet	[r] 106,164	113,435	107,680
Natural gas liquids [10] 42-gallon barrels	[e] 49	[e] 56	NA
Petroleum:			
Crude oil do	[r] 3,460	3,400	[e] 3,800
Refinery products: [11]			
Gasoline, aviation do	318	[e] 295	NA
Gasoline, motor do	2,550	[e] 2,456	NA
Jet fuel do	2,911	[e] 2,783	NA
Kerosine do	4,649	[e] 4,453	NA
Distillate fuel oil do	7,492	[e] 7,171	NA
Residual fuel oil do	11,014	[e] 10,544	NA
Lubricants do	524	[e] 491	NA
Other do	2,698	[e] 2,652	NA
Refinery fuel and losses do	1,990	[e] 1,899	NA
Total do	34,146	[e] 32,744	NA
BANGLADESH (FORMERLY EAST PAKISTAN) [10]			
METALS			
Iron and steel:			
Crude steel [e] thousand tons	100	100	NA
Mild steel products [3] do	210	127	NA

Table 1.—Pakistan (including Bangladesh) [1]: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity [2]	1969	1970	1971 [p]
BANGLADESH (FORMERLY EAST PAKISTAN) [10]—Continued			
NONMETALS			
Cement, hydraulic .... thousand tons..	60	67	[e] 30
Clays, kaolin (china)	3,915	3,184	[e] 1,800
Fertilizer materials, manufactured, nitrogenous:			
Gross weight	85,274	86,828	[e] 52,000
Nitrogen content	39,738	40,462	[e] 24,000
Limestone .... thousand tons..	80	177	[e] 40
Salt, marine, evaporated .... do....	291	224	[e] 130
MINERAL FUELS AND RELATED MATERIALS			
Gas, natural, sales .... million cubic feet..	10,757	20,421	NA

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] To the extent possible, output of the former east wing of Pakistan (now Bangladesh) and the former west wing of Pakistan (now the entirety of Pakistan) has been subdivided as indicated in available sources.

[2] In addition to the quantities of commodities listed for Pakistan (former west wing), additional quantities of some crude construction materials in provinces not reporting to the Central Government on such output are included; and Bangladesh presumably produces some quantities of such materials (clays, sand and gravel, and stone) for local consumption, but information is inadequate to make reliable estimates of output levels. In the case of those commodities produced in Pakistan for which data is believed to represent only partial output, no attempt has been made to estimate the balance of production, but these commodities have been appropriately footnoted.

[3] Types of products included are not specified in source.

[4] Sind Province only.

[5] Data are for urea and ammonium sulfate; ammonium nitrate presumably is still produced, but recent data are not available because of Pakistan Government restrictions. In the year ending June 30, 1965 (latest data available) ammonium nitrate output totaled 76,086 tons (gross weight) with a nitrogen content of 26,630 tons.

[6] As reported by North-West Frontier Province only, no details on the nature of this sand are available.

[7] Punjab and Sind Provinces only.

[8] Reported in source as "ordinary stone."

[9] Origin not reported.

[10] Including output of Bangladesh.

[11] Petroleum refinery output for the Chittagong refinery in Bangladesh is included with output of the three refineries in Pakistan (former west wing); the Chittagong refinery's rated capacity is about 29 percent of the total capacity for Pakistan and Bangladesh, but distribution of actual production is impossible because of lack of detailed information on individual plant operations.

TRADE

Pakistan's official trade statistics indicated that exports and imports increased slightly over the previous fiscal year. During 1970–71 overall imports rose to $1,087 million and overall exports (including reexports) reached $706 million, providing a trade imbalance of $381 million.

Only small quantities of mineral commodities have been available for export. If petroleum products produced from imported crude oil were excluded, then mineral exports would total only $7.6 million in fiscal year 1970–71.

Imports of metals, minerals and fuels reached $270 million dollars in fiscal year 1970–71 or almost one-fourth of total imports. Iron and steel, fertilizer materials and crude petroleum accounted for almost three-fourths of the value of total mineral commodity imports.

Table 2 based on official trade information, provides the best available quantitative data on the limited quantities of mineral exports. It should be noted that the leading commodities exported in recent years have been cement and salt.

The following tabulations show the value of recorded mineral commodity exports and reexports and mineral commodity imports, respectively.

Commodity or commodity group	Value of exports, and reexports (million dollars) 1969–70	1970–71
Chromite	1.4	0.7
Other metallic ores	.2	----
Metals including scrap	.1	.1
Cement	3.8	4.2
Gem stones except diamond	.4	.2
Salt	.4	.4
Stone, sand and gravel	1.0	.9
Petroleum and petroleum refinery products	10.5	8.4
Other	.4	1.1
Total	18.2	16.0

Commodity or commodity group	Value of imports (million dollars)	
	1969–70	1970–71
Iron and steel including scrap	95.3	107.1
Other metals including scrap	16.7	19.7
Fertilizer materials	71.5	44.5
Coal	8.1	8.4
Crude petroleum	43.5	45.6
Refined petroleum	10.9	32.3
Other	13.2	12.8
Total	259.2	270.4

Table 2.—Pakistan (including Bangladesh): Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969–70	1970–71
METALS		
Aluminum metal including alloys, semimanufactures	1	2
Chromium ores and concentrates	51,455	23,885
Copper metal including alloys:		
Matte	44	-------
Semimanufactures	7	1
Iron and steel:		
Scrap and pig iron	9	1
Semimanufactures	517	80
Platinum troy ounces	-------	160
Zinc:		
Ores and concentrates	20	-------
Metal including alloys, semimanufactures	4	-------
Other:		
Ores and concentrates n.e.s	6,300	-------
Scrap, nonferrous	-------	216
NONMETALS		
Barite	4,808	356
Cement, hydraulic	288,714	307,077
Chalk, crude	31	16
Clays and products:		
Crude	306	23
Fire bricks	256	3,334
Fertilizer materials, crude potassic	-------	91
Gem stones other than diamond kilograms	19,108	9,878
Gypsum	9,241	20,963
Mica	4	10
Salt	102,887	81,301
Stone, sand and gravel:		
Dimension stone	11,091	8,221
Crushed and broken stone	228	629
Sand	422	17
Strontium minerals, celestite	-------	2
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	-------	2,923
Coal and coke	1,222	985
Petroleum:		
Crude oil thousand 42-gallon barrels	139	-------
Topped crude do	5,186	[1] 1,088
Refinery products:		
Gasoline do	75	1
Kerosine and jet fuel do	2	17
Distillate fuel oil do	205	137
Residual fuel oil do	3,791	3,045
Lubricants do	7	11
Other do	1	([2])

[1] Reported in source as "topped crude—naphtha."
[2] Less than ½ unit.

COMMODITY REVIEW

METALS

Aluminum and Bauxite.—No additional information has been received on the 1968 agreement by the Governments of Iran and Pakistan and the Reynolds Aluminum Corp. (United States) for the erection of a 50,000-ton-per-year aluminum plant at Ark, Iran. There was no news that construction of the plant had begun by yearend 1971.

Pakistan's production of bauxite for domestic consumption has for unexplained reasons declined sharply since 1969 with only a token output in 1971. All of the 1971 production originated in the province of Punjab.

Chromite.—Production entirely from Baluchistan was only slightly lower than that of 1970. During the fiscal year 1970–71, 23,885 tons of chromite were exported; 20,449 tons to the United States and 3,436 tons to Japan.

Iron and Steel.—In January 1971, the U.S.S.R. and the Government-owned Pakistan Steel Mills Corp. (PSMC) signed a detailed credit agreement to provide Pakistan with a 1-million-ton steel mill at Buleji, West of Karachi. This project will include the construction of required port facilities and employee housing, provision for Soviet technical assistance, and establishment of training facilities for workers. The agreement also permitted the U.S.S.R. to fly aerial geologic surveys over Pakistan in order to map potential supplies of iron ore and coal for the plant. However, there is little expectation of utilizing indigenous materials because the known iron ore deposits at Kālābāgh, West Pakistan, are thought to be low grade. Shipment of Afghan and Iranian ore to Pakistan pose a difficult transport problem. Serious consideration has been given to the importation of iron ore and coking coal from Australia for use of this plant. Project completion is expected in 1976 and full production is hoped for by 1979.

Discovery of iron ore deposits has been reported in the Shekrān area of Pakistan. The West Pakistan Industrial Development Corp. has been conducting work here to determine the quantity and quality of the available reserves which may be of the order of 10 million tons.

Uranium.—The Pakistan Atomic Energy Commission has carried out laboratory tests and constructed a 1,000-pound-per-day pilot plant to demonstrate the feasibility of processing uranium ore from Dera Ghāzi Khān. Engineers from the Atomic Energy Center at Lahore designed and built the pilot plant that will be used to establish the optimum production parameters for processing uranium ore and provide the necessary information to scale the process up to a commercial size plant.

NONMETALS

Barite.—Pakistan's barite output remained strong, achieving almost the same level of production as that of 1970. However, exports of barite during the fiscal year 1970–71 almost disappeared, declining sharply to about 7 percent of the exports of the previous year. This could be indicative of greater domestic demand. According to official Government sources production was recorded in both the Northwest Frontier and Baluchistan Provinces with the former contributing the greater share.

Cement.—During the year, nine cement plants were in operation in Pakistan and one in Bangladesh. Production in Pakistan showed a minor increase. However, the small production from the single plant in Bangladesh was reduced by almost half. During fiscal 1970–71 Pakistan's cement exports continued to rise, and a total of 307,000 tons were shipped to the following countries: Kuwait, 95,000 tons; Dubai, 64,000 tons; and Arabian peninsular countries (such as Abu Dhabi, Bahrain, Oman, Qatar, Saudi Arabia), 148,000 tons. Cement exports represent only a small part of domestic production. However, prospects of increasing Pakistan's exports of cement are good because of its geographical location. Apparently Pakistan can even supply cement at competitive prices to countries in Africa, the Middle East, and Southeast Asia, since many developing countries are dependent to some extent on imported cement.

Fertilizer Materials.—Various chemical fertilizers such as urea and superphosphate were produced by four plants in Pakistan and one plant in Bangladesh. Pakistani urea production declined slightly from 206,350 tons in fiscal 1969–70 to 204,724 tons in fiscal 1970–71. Urea production from Bangladesh also declined from 95,809 tons in fiscal 1969–70 to 52,019 tons in fiscal 1970–71. Superphosphate, which was manufactured in Pakistan only, increased from 23,254 tons in 1969–70 to 25,418 tons in 1970–71. Ammonium sulfate was also produced in Pakistan and production rose slightly from 58,322 tons in fiscal 1969–70 to 59,646 tons in fiscal 1970–71.

The Dawood Hercules chemical fertilizer plant located near Sheiphrura, 17 miles west of Lahore has begun full production. With an annual capacity of 345,000 tons it became the largest urea plant in Pakistan.

Salt.—Marine salt was produced by solar evaporation at 16 Pakistani operations and 198 Bangladesh operations. Salt production rose in Pakistan to slightly above the 1969 level but declined in Bangladesh to 42 percent from the 1970 level. The bulk of the rock salt was mined in Pakistan's Punjab Province and lesser quantities in the Northwest Frontier Province. Combined salt production in Pakistan and Bangladesh exceeded 750,000 tons. Significant quantities of salt produced by both countries were exported.

MINERAL FUELS

The areas' consumption of all forms of commercial fuels was estimated to be slightly in excess of 9 million tons of fuel oil equivalent in 1971, a small increase from the previous years. During 1971, the breakdown of the Pakistan national energy requirement by source was estimated as follows: Oil, 42.5 percent; natural gas, 34.6 percent; hydroelectric power, 11.8 percent; and coal 11.1 percent.

Coal.—Production remained stable during the year but fell short of the 3.5 million-ton-per year target specified by the fourth 5-year plan set forth by the Government in 1970. A significant quantity of Pakistan's production continues to be exported annually.

By yearend, no information had been received to indicate that Pakistan's plans to build a coal briquetting plant using unmarketable coal fines had been implemented.

Bangladesh continued to rely on coal imports to meet its domestic demand.

Natural Gas.—This commodity continued to be the areas' major form of mineral production. The Dhulian oil and Māri and Sui gasfields of Pakistan supplied almost 108,000 million cubic feet of natural gas for the Nations' developing industry. Production of electricity, cement, and fertilizer consumed approximately 70 percent of the natural gas produced. Natural gasfields in Bangladesh were also worked to capacity levels.

Pakistan as yet has not exported natural gas. However, with the country's large reserves of natural gas, it is possible that liquefaction plants may be built in the future to prepare liquefied natural gas for shipment abroad. Adequate technology is currently available for the preparation of liquefied natural gas and does not present a limiting factor.

Petroleum.—Crude oil production remained strong in 1971 but was far from adequate to meet domestic requirements. Imports of crude oil were valued at $45.6 million during the fiscal year 1970–71. Three refineries with a total daily capacity of 90,000 barrels per day processed the imported crude. Two of these plants are located at Karachi, Pakistan, and another at Chittagong, Bangladesh. An additional refinery operation with a capacity of 10,000 barrels per day near Rawalpindi processes domestic crude petroleum. Large tonnages of refined petroleum products have also been imported for domestic consumption.

The Mineral Industry of Peru

By Frank E. Noe[1]

The year 1971 was something of an economic disappointment to Peru. Following a year of substantial economic growth, several adverse economic and political forces joined in 1971 to reduce economic growth and to generate serious balance of payments and budgetary deficits. Important short-term factors that contributed to these difficulties were the drop in world mineral prices and prolonged labor disruptions in the mining industry which practically eliminated that sector's tax liability and sharply reduced its earnings of foreign exchange. Perhaps the biggest disappointment was the continued lack of investor enthusiasm created by the uncertainty generated by the Government's restructuring reforms. The major economic development of the year was the discovery of oil by Petróleos del Perú (Petroperu) in the northeastern Amazon region, together with the signing of four exploration-exploitation contracts with overseas oil companies. The only other major arrangement with foreign groups in the minerals field was the signing of a detailed basic agreement with a British consortium for bringing the medium-sized Cerro Verde copper deposit into production by 1974. According to preliminary estimates, the gross national product (GNP) increased about 6.0 percent, substantially below the 7.5-percent increase of the preceding year. While the balance of trade remained favorable despite a drop from $426 million in 1970 to $140 million in the current year, the balance of payments declined sharply from a positive $320 million in 1970 to a deficit of $76 million in 1971. According to the National Society of Mining and Petroleum, the contribution of the mineral industry to the GNP was 6.2 percent as compared with 6.8 percent in 1970. The Society explained that these percentages were obtained using 1970 prices as a new base of measurement instead of the 1963 prices used in previous years and by using new accounting criteria which included smelting and refining. The contribution of the metals subsector declined 2.7 percent as a result of lower production volume due to strikes in the industry and decreased value resulting from the substantial drop in international metal prices. Although the production of nonmetals destined for the construction and manufacturing industries increased significantly, the contribution of the nonmetal and fuels sector to the GNP decreased by 6.3 percent, principally because of lower petroleum production in the northwest fields of the country. As in 1970 labor relations in the mining industry continued to deteriorate sharply. Although agreements with unions were in effect, there were 79 strikes that resulted in production losses of exportable material worth about $55 million. In addition to the losses suffered by the mining companies, the Government was forced to cut its 2-year budget by 6.5 percent because of low revenues from the mining sector. Early in December, the Government issued Decree Law 19040 and Supreme Decrees 006 and 007-71-TR aimed at bringing some order to the confusion and setting up a series of systems designed to make wage bargaining speedier and the results longer lasting. Other relevant legislation expected in the not too distant future is a law for the reorganization of trade unions.

During 1971 the Empresa Minera del Perú (Minero Perú), the Government's new mining company, completed its first year's activities. The main task during this first year was the simultaneous organization, establishment, and application, of operational procedures for Minero Perú. The two major achievements of Minero Perú during this first year of operation were the initiation of exploitation of the Cerro Verde copper deposit and implementation of Minero Perú's ore marketing policy. On October 14 Minero Perú became officially responsible for the marketing of all Peru's copper production. Additionally, although no dates were established as deadlines, Minero Perú was completely involved in controlling and handling all of Peru's other minerals and metals exports. The state company has not declared contracts void and moved in to try to handle all sales on its own. The emphasis rather has been on a gradual takeover from the merchants as current contracts expire, on a schedule which anticipates complete handling by Minero Perú of all minerals sales internationally by 1977. The company opened a new market for Peruvian metals and minerals by signing a contract with the People's Republic of China for the sale of mineral products amounting to $45 million. Minero Perú also had under consideration seven projects for the next 5 years calling for an investment totaling about $600 million. Besides the exploitation of Cerro Verde, these projects included development of the Tintaya, Michiquillay, and Quellaveco copper deposits. The remaining three projects were for a copper refinery, a lead refinery, and a zinc refinery. Prefeasibility studies for the construction of the lead and zinc refineries to be located in Lima were undertaken during the year. The annual capacity of the lead refinery will be 65,000 tons and of the zinc refinery 150,000 tons. The copper refinery is to be located 9 kilometers north of the port of Ilo and to have an initial capacity of 125,000 tons, to be expanded later to 150,000 tons. The survey of the feasibility of this project has been completed with the collaboration of the Japan Consulting Institute.

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[1] Supervisory physical scientist, Division of Nonferrous Metals.

The most important mining legislation effective in 1971 was Decree Law 18880 published on June 9. The new law restates the normative mining law, Decree 18225 of April 14, 1970, in greatly expanded and more detailed form. It consists of 339 articles, plus 18 transitory dispositions, and a list of definitions.

Two significant modifications in the law are (a) an increase in the maximum reinvestment allowance per year from $4.6 million to $7.0 million and (b) an additional promotional or incentive provision for associated (mixed government and private Peruvian interests) and special mining (mixed government and foreign, with or without Peruvian private interests) companies allowing them to benefit from these provisions for double their investment recovery periods and granting them a one-third reduction in income tax during the investment recovery period.

A new feature of the law requires each mining company to constitute a mining community representing all workers in their participation in the property, direction, and benefits of the company. All full-time workers are members only so long as they remain with the company. A mining compensation community is to be established to strengthen solidarity of workers in the mining industry through redistribution of compensation received by them. All mining communities are members of the mining compensation community.

The mining companies will pay to the mining community 10 percent of their net income before taxes which will be applied in the following manner: (a) 4 percent as liquid participation, in cash and (b) 6 percent as property participation. The 4 percent of the net income which constitutes the liquid participation of the workers will be distributed in the following manner: (a) 20 percent will be given directly to the mining community and (b) the remaining 80 percent will be given, through the mining community, to the mining compensation community, which, adding together all contributions received, will proceed to redistribute them among all the mining communities in direct proportion to the number of man-days worked by their corresponding companies. (In effect, this is the law's anti-strike incentive provision.) The individual mining community's 20 percent is to be distributed annually among all the workers of the company as follows: 50 percent in equal parts, and the remaining 50 percent in direct proportion to the basic personal pay levels.

The 6 percent corresponding to the property participation of the workers will be reinvested in the same company and capitalized free of tax immediately until it reaches 50 percent of the captial of the company. After this, the 6 percent will be invested by the mining community directly in the Peruvian Development Finance Corp. In cases of public sector, associated, and special mining companies, the 6 percent will be invested in bonds of the company rather than shares with provisions also for investment in securities of the Peruvian Development Finance Corp. The shares, bonds, and other securities are to be distributed as follows: 20 percent directly to the particular mining community concerned, and 80 percent to the mining compensation community, which will then issue its own shares representing those it has received from its member communities and distribute them to those members in direct proportional relationship to the number of man-days worked by their corresponding companies. Dividends and interest received by the mining compensation community will be distributed among all mining communities in proportion to their shareholding in the mining compensation community.

The Board of Directors of the mining company will include from the date of inscription of the mining community at least one representative of the latter, and this number will increase in accordance with the community's increased participation in the capital of the company. This increase will be a function of the total number of shares or participation held by both the mining compensation community and the mining community. In the case of public sector, associated, and mixed mining companies, the Board of Directors will include two representatives of the mining community from the date of inscription of the latter. When the workers have reached ownership of 50 percent of the capital of the company, the President of the Board will be elected by simple majority among the Directors.

Decree Law 19034 of November 16 established the Empresa Siderúrgica del Perú (SIDERPERU) which is to handle Peru's iron and steel production and marketing. The company is to operate as a government decentralized entity directly responsible to the Ministry of Industry and Commerce. The organic law for SIDERPERU established operational features similar to Minero Perú and Petroperu, the state corporations handling Peru's mining and petroleum. The law also provides for the absorption of the Sociedad Siderúrgica de Chimbote, S.A. (SOGESA), by SIDERPERU, with SOGESA's assets forming just over half the new corporation's capital of about $273 million. The objectives of the company are the production of steel and the direct or indirect marketing of steel and its related products; the execution of programs of investment, production, and promotion, in conformity with the sectoral plans; the promotion of steel industry development by stimulating the investment in installations to transform products originating from steel; and research and technical development studies related to steel production and its raw materials. SIDERPERU for a period of 10 years will be exonerated of property taxes, certain stamp taxes for banking and accounting transactions, and also taxes normally applicable to exportation of its products.

PRODUCTION

Mine production of Peru's metallic minerals was generally lower in 1971 as a series of labor strikes plagued the industry. Of the major metals, production of copper, silver, gold, and iron were lower while lead and zinc mine production increased. Output of indium, cadmium, manganese, and selenium, also increased although these are of minor importance to the Peruvian mining industry. Although data pertaining to nonmetallic mineral production in 1971 had not become available by August 1972, the construction boom undoubtedly resulted in an increased production of the nonmetals. Crude petroleum production decreased for the third straight year while output of bituminous coal decreased as the Cerro de Pasco Corp. (Cerro-Peru) closed its depleted coal mine at Goyllarisquisga.

Table 1.—Peru: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971[p]
METALS			
Antimony:			
Mine output, metal content	613	1,167	1,022
Metal (content of antimonial lead bars)	364	408	311
Arsenic, white	481	772	656
Bismuth:			
Mine output, metal content	680	806	722
Metal	652	763	600
Cadmium:			
Mine output, metal content	[r] 442	482	706
Metal	168	186	171
Copper:			
Mine output, metal content	198,803	220,225	212,885
Copper sulfate	723	764	NA
Metal:			
Blister	133,926	140,741	134,161
Refined	34,465	36,178	32,561
Gold:			
Mine output, metal content ... troy ounces	[r] 131,641	107,677	98,928
Metal ... do	[r] 75,172	55,795	37,456
Indium ... kilograms	997	1,557	1,868
Iron and steel:			
Iron ore and concentrate ... thousand tons	9,270	9,713	8,831
Pig iron (excluding blast furnace ferroalloys) ... do	176	86	90
Steel ingot and casting ... do	192	94	99
Lead:			
Mine output, metal content	154,543	156,770	177,547
Metal	[r] 77,880	72,474	67,135
Manganese:			
Ore and concentrate, gross weight	12,000	1,922	7,803
Metal content	2,656	635	2,335
Mercury ... 76-pound flasks	3,592	3,196	3,390
Molybdenum mine output, metal content	224	607	808
Selenium ... kilograms	6,841	6,755	7,076
Silver:			
Mine output, metal content ... thousand troy ounces	35,886	39,835	38,398
Metal ... do	19,525	21,906	15,774
Tellurium metal ... kilograms	17,287	30,115	23,933
Tin mine output, metal content ... long tons	[r] 72	103	103
Tungsten mine output, metal content	689	804	971
Zinc:			
Mine output, metal content	[r] 300,303	299,136	387,463
Metal, refined	62,277	68,688	57,196
NONMETALS			
Barite	148,839	236,321	[e] 236,000
Cement, hydraulic ... thousand tons	1,137	1,144	[e] 1,150
Chalk	597	--	NA
Clays:			
Bentonite	25,918	35,578	NA
Fire	30,955	32,245	NA
Kaolin	1,604	1,549	[e] 1,500
Common	154,429	51,658	NA
Diatomite	20,597	2,559	[e] 2,700
Feldspar	1,035	2,863	[e] 2,900
Gypsum:			
Crude	45,024	89,940	[e] 90,000
Calcined	38,378	56,595	[e] 57,000
Lime	20,953	9,715	[e] 9,700
Phosphate, guano	20,112	50,226	[e] 50,300
Salt, all types	92,802	190,577	[e] 191,000
Stone:			
Dimension:			
Marble[1]	6,868	1,092	[e] 1,100
Slate	--	16	[e] 16
Crushed and broken:			
Dolomite	8,142	5,123	[e] 5,000
Gravel and sand ... thousand tons	2,233	2,422	[e] 2,400
Limestone ... do	1,078	1,841	[e] 1,900
Quartzite	--	2,612	[e] 2,600
Silica	[r] 5,273	33,984	[e] 34,000
Talc and related materials, pyrophyllite	7,818	7,908	[e] 8,000
MINERAL FUELS AND RELATED MATERIALS			
Coal:			
Anthracite	7,588	20,069	[e] 20,000
Bituminous	154,181	136,000	[e] 110,000
Coke, all types	47,716	29,412	[e] 29,000
Gas, natural, gross production ... million cubic feet	74,452	75,182	67,227
Natural gas liquids ... thousand 42-gallon barrels	987	949	[e] 900

See footnotes at end of table.

Table 1.—Peru: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971 [p]
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum:			
Crude ____ thousand 42-gallon barrels	26,329	26,272	22,588
Refinery products: [2]			
Aviation gasoline ____ do	30	12	1
Motor gasoline ____ do	9,744	9,523	10,434
Jet fuel ____ do	1,420	1,536	1,419
Kerosine ____ do	3,792	3,963	4,314
Distillate fuel oil ____ do	6,823	6,719	7,007
Residual fuel oil ____ do	7,766	7,765	9,329
Liquefied petroleum gas ____ do	272	310	380
Lubricants ____ do	65	79	64
Asphalt ____ do	215	285	256
Other ____ do	336	102	130

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.
[1] Includes ground marble.
[2] Excludes refinery fuel and losses.

TRADE

Unofficial figures indicate that total exports declined to $893 million from the 1970 high of $1,048 million. Imports increased to $753 million from $622 million the previous year.

As before, minerals accounted for the major share of the total, provisional figures for minerals being $400 million or about 45 percent of the total foreign exchange income. The value of mineral exports decreased 21.9 percent with respect to the 1970 period, while the decrease in volume of mineral exports was only 5.9 percent. Lower international metal quotations and production loss due to strikes were responsible for the decreases in volume and value.

Copper shipments during 1971, at 193,519 tons, were 10.2 percent below 1970 exports. Copper shipments represented 19 percent by value of total exports and 42.5 percent of the value of all mineral exports. Zinc, with an export increase of 3.8 percent in volume, was the only one of the principal metals to improve its position.

	Value (million dollars)	
	Mineral commodity trade	Total commodity trade
Exports:		
1969	476	866
1970	512	1,048
1971 [p]	400	893
Imports:		
1969	62	600
1970	NA	622
1971 [p]	NA	753
Trade balance:		
1969	+414	+265
1970	NA	+426
1971	NA	+140

[p] Preliminary. NA Not available.

The United States, Japan, and West Germany represented the major mineral markets for Peru. In June the Peruvian Government obtained a new trading partner by signing an agreement with the People's Republic of China to supply 40,000 tons of copper, 10,000 tons of electrolytic zinc, and 10,000 tons of electrolytic lead before the end of 1972. It has been estimated that about 8,000 tons of blister cop-

Table 2.—Peru: Selected mineral products exported (f.o.b.)

Mineral product (fine content)	1969 [1]		1970 [2]		1971 [3]	
	Quantity (metric tons)	Value (millions)	Quantity (metric tons)	Value (millions)	Quantity (metric tons)	Value (millions)
Copper	200,523	$259	215,572	$269	193,519	$170
Silver	1,065	58	1,171	62	1,025	47
Iron ore	9,040,599	63	10,050,146	66	9,010,141	62
Lead	156,157	35	159,040	35	145,698	27
Zinc	310,843	39	331,996	47	344,531	47

[1] Ministerio de Economia y Finanzas, Dirección General de Aduanas, Lima, Peru. Estadística del Comercio Exterior, 1969.
[2] U.S. Embassy, Lima, Peru. State Dept. Airgram A-88, Mar. 26, 1971.
[3] U.S. Embassy, Lima, Peru. State Dept. Airgram A-115, Apr. 6, 1972.

Table 3.—Peru: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969 [1]	1970 [2]	Principal destinations, 1970
METALS			
Antimony:			
Ore and concentrate	975	NA	
Metal including alloys, all forms	89	([3])	
Arsenic, trioxide	208	[4] 100	All to United States.
Bismuth metal including alloys, all forms	702	NA	
Cadmium:			
Intermediate metallurgical products	21	NA	
Metal including alloys, all forms	166	NA	
Copper:			
Ore and concentrate	208,762	[4] 137,089	Japan 111,642; Spain 10,005.
Matte and cement	1,135	[4] 2,558	Japan 1,855; Spain 703.
Metal including alloys:			
Blister	135,835	[3] 138,416	United States 97,764; Belgium-Luxembourg 17,273; West Germany 16,896.
Refined	32,479	[3] 32,797	Netherlands 20,391; United States 4,906.
Semimanufactures	234	NA	
Gold:			
Ore and concentrate [5] troy ounces	38,718	45,357	NA.
Metal unworked or partly worked do	13,883	[6] 97,325	NA.
Iron and steel:			
Iron ore, concentrate and pellets	9,040,599	9,278,515	NA.
Metal scrap	31,134	NA	
Lead:			
Ore and concentrate	167,514	[4] 144,409	West Germany 38,974; United Kingdom 27,569; Japan 27,519.
Metal including alloys, all forms	75,945	[3] 62,597	Mainly to United States.
Mercury 76-pound flasks	2,109	[4] 2,466	Japan 2,205.
Molybdenum ore and concentrate	662	[4] [7] 1,299	France 614; West Germany 392.
Selenium, elemental kilograms	5,424	NA	
Silver:			
Ore and concentrate [5] thousand troy ounces	16,111	19,139	NA.
Metal including alloys:			
Refined and electrolytic do	14,541	16,822	NA.
Blister and mixed bars do	3,587	3,217	NA.
Tellurium, elemental kilograms	17,795	NA	
Tin, ore and concentrate long tons	162	[4] 1,092	All to United Kingdom.
Tungsten ore and concentrate	2,268	[4] 1,273	United Kingdom 598; Japan 491.
Zinc:			
Ore and concentrate	484,091	[4] 491,296	Japan 297,578; France 90,907; United States 43,579.
Metal including alloys, all forms	59,478	[3] [8] 59,834	United States 25,876; Brazil 9,795; Netherlands 7,915.
Other base metals including alloys, all forms, n.e.s	1	NA	
NONMETALS			
Asbestos	NA	[4] 468	All to France.
Barite and witherite	106,821	[9] 153,968	All to United States.
Cement	58,271	70,610	NA.
Clays and products (including all refractory brick):			
Crude, bentonite	50	NA	
Products	26	NA	
Fertilizer materials, crude and manufactured	2,791	[4] 1,900	West Germany 1,342.
Salt	529	NA	
MINERAL FUELS AND RELATED MATERIALS			
Petroleum:			
Crude thousand 42-gallon barrels	1,644	1,767	Mainly to United Kingdom.
Refinery products:			
Distillate fuel oil do	91	99	All to bunkers.
Residual fuel oil do	137	100	Do.
Other do	4	145	NA.

NA Not available.

[1] Source: Ministerio de Economia y Finanzas. Estadística del Comercio Exterior 1969, Lima, 1971, 519 pp.

[2] Source: Ministerio de Energia y Minas, Dirección General de Mineria, Anuario de La Mineria del Peru, 1970. Lima, 1971, 151 pp., unless otherwise specified.

[3] Source: Metallgesellschaft A.G. Metal Statistics, 1961–71, 59th Edition, Frankfurt-am-Main, 1972, 318 pp.

[4] Source: Statistical Office of the United Nations. Supplement to the World Trade Annual, 1970. South and Central America including the Carribbean, v. 2, New York 1972, pp. 335–339.

[5] Content in ores, concentrates, and refinery products of base metals included.

[6] Includes monetary.

[7] Includes ores of vanadium, zirconium, tantalum, and titanium, if any.

[8] Slab only.

[9] Source: United States' official trade returns.

Table 4.—Peru: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969 [1]	1970 [2]	Principal sources, 1970
METALS			
Aluminum:			
Bauxite and concentrate	1,562	NA	
Oxide and hydroxide	2,327	2,808	West Germany 2,760.
Metal including alloys:			
Scrap	NA	290	All from United States.
Unwrought	2,947	2,874	Canada 1,860; United States 1,014.
Semimanufactures	1,641	1,989	Belgium-Luxembourg 377; West Germany 326; Austria 274.
Arsenic, natural sulfides kilograms	4,426	NA	
Cadmium metal including alloys, all forms do	262	NA	
Chromium:			
Chromite	NA	1,000	All from United States.
Oxide and hydroxide kilograms	28,449	NA	
Metal including alloys, all forms do	391	NA	
Copper metal including alloys, all forms:			
Unwrought	2	NA	
Semimanufactures	570	494	West Germany 244; United States 49; Japan 41.
Gold metal unworked or partly worked troy ounces	67	NA	
Iron and steel:			
Ore and concentrate	25	NA	
Metal:			
Scrap	2,942	3,113	All from United States.
Sponge iron, powder and shot	141	263	Do.
Ferroalloys	936	612	France 369; United States 243.
Steel, primary forms	130	8,372	United States 7,515; Japan 857.
Semimanufactures	155,036	98,947	United States 29,091; Japan 23,776; Belgium-Luxembourg 10,493.
Lead metal including alloys, all forms	45	24	All from United States.
Magnesium metal including alloys, all forms kilograms	5,220	NA	
Manganese:			
Ore and concentrates	NA	407	All from United States.
Oxides	NA	313	All from Japan.
Mercury 76-pound flasks	8	NA	
Nickel metal including alloys, all forms	33	49	West Germany 38.
Platinum-group metals including alloys, all forms troy ounces	186	NA	
Selenium and tellurium	223	NA	
Tin metal including alloys, all forms long tons	203	93	Denmark 84; United Kingdom 9.
Titanium oxides	1,298	332	West Germany 247; Japan 85.
Zinc:			
Oxide	15	NA	
Metal including alloys, all forms	135	42	All from Japan.
Other:			
Ore and concentrate n.e.s	1,621	1,005	All from United States.
Scrap	NA	164	Do.
Metal including alloys, all forms	11	NA	
NONMETALS			
Abrasives, natural, n.e.s	249	88	Italy 39; West Germany 27.
Asbestos	2,694	5,289	All from Canada.
Barite and witherite	248	--	
Boric oxide and acid	249	636	All from United States.
Cement	12,091	4,442	Spain 3,350; Japan 1,092.
Chalk	899	--	
Clays and products (including all refractory brick):			
Crude n.e.s	5,380	5,282	United States 3,983; United Kingdom 801.
Products, refractory (including non-clay bricks)	NA	[3] 2,449	Austria 813; France 598; West Germany 582.
Diamond:			
Gem not set or strung value	NA	$483,000	All from Belgium-Luxembourg.
Industrial do	NA	$60,000	All from United States.
Diatomite and other infusorial earths	1,849	NA	
Feldspar and fluorspar	745	595	All from United Kingdom.
Fertilizer materials:			
Crude, phosphatic	11,187	8,165	All from United States.
Manufactured:			
Nitrogenous	78,751	59,709	West Germany 19,905; United States 18,037; Belgium-Luxembourg 17,273.
Phosphatic	85	--	

See footnotes at end of table.

Table 4.—Peru: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969[1]	1970[2]	Principal sources, 1970
NONMETALS—Continued			
Fertilizer materials—Continued			
Manufactured—Continued			
Potassic	8,128	6,488	West Germany 4,150; United States 1,246.
Other including mixed	7,642	4,929	United States 1,756; West Germany 1,671.
Ammonia	40	--	
Graphite, natural	40	--	
Gypsum and plasters	282	--	
Magnesite	1,527	2,242	All from United States.
Mica, all forms	139	--	
Salt	3,130	--	
Soda, caustic	2,002	3,133	United States 2,885; West Germany 248.
Stone, sand and gravel:			
Dimension stone crude and partly worked	619	689	All from Italy.
Dolomite	25	1,439	All from France.
Gravel and crushed rock	46	--	
Quartz and quartzite	60	--	
Sand excluding metal bearing	3,085	2,243	All from United States.
Sulfur, elemental	1,069	947	Do.
Talc and steatite	802	277	All from Italy.
Other:			
Oxides and hydroxides of magnesium, strontium, and barium	NA	68	All from United States.
Unspecified nonmetals	20	NA	
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	222	NA	
Carbon black	3,581	220	United States 112; Japan 108.
Coal including briquets, all grades	8,258	20,625	Norway 12,103; United States 8,502.
Coke and semicoke	1,047	104,522	United States 35,367; Australia 25,298.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	5,512	5,721	NA.
Refined products:			
Gasoline do	248	166	NA.
Residual fuel oil do	2,031	3,283	NA.
Lubricants do	r 265	246	NA.
Other do	r 930	420	NA.
Mineral tar and other coal–, petroleum–, or gas–derived crude chemicals	2,052	NA	

r Revised. NA Not available.

[1] Source: Ministerio de Economia y Finanzas, Dirección General de Aduanas. Estadística del Comercio Exterior 1969, Lima, 1971, 519 pp.

[2] Source: Statistical Office of the United Nations. Supplement to the World Trade Annual, 1970. South and Central America, including the Caribbean and Bermuda, v. 2, Walker and Company, New York, 1972, pp. 340–358.

[3] Partial figure; United States and Canada listed as source countries but quantity not reported.

per, 4,300 tons of electrolytic copper, 5,000 tons of electrolytic zinc, and 5,000 tons of electrolytic lead will be shipped in 1971 with the remainder of the contract to be shipped in 1972.

Detailed commodity trade data for 1970 and 1971 had not become available by late 1972, but the five minerals listed in table 2 constituted about 88 percent of the value of minerals exported.

Tables 3 and 4 present official Peruvian export and import data for 1969 and unofficial figures for 1970 derived from a variety of sources. A part of the 1970 export data (table 3) and all of the 1970 import data (table 4) are from official trade returns of selected trading partner countries (the United States, Canada, Australia, Japan and the industrialized nations of non-Communist Europe). As such they are incomplete, but are believed to include the bulk of Peru's trade for 1970.

COMMODITY REVIEW

METALS

Copper.—The Government recovered the last of the large undeveloped copper deposits early in January by cancelling Southern Peru Copper Corp.'s (SPCC) Quellaveco concession for failure to file the required development and financial schedules. Quellaveco, the smallest and lowest grade of the three original Southern Peru orebodies, contains about 200 million tons of slightly less than 1.0 percent copper. This was the fifth major copper concession canceled by the Government because the mining companies could not obtain immediate financing to bring them into production nor secure long-term sales contracts. During the second quarter of 1971, the Government allotted Minero Perú the sum of $1.4 million to continue exploration of the Quellaveco copper deposit over the next 2 years. It has been estimated that it would cost around $150 million to bring Quellaveco into production.

The Government's first major copper mining project at Cerro Verde, an Anaconda concession until 1970, was the object of heated competition between a Belgian consortium and a British-Canadian consortium. In spite of a preliminary agreement signed in February between Minero Perú and the Belgian consortium, the British-Canadian group were eventually victorious when the Government signed mining and construction agreements with the latter group in October. The final contract which detailed financing, however, was not signed until the latter half of 1972. The final contract was delayed to await the finish of a technical-economic study to be completed by the consortium members, British Smelter Constructions, Ltd., and their Canadian associates, Wright Engineers, Ltd., of Vancouver. The agreement with the British represents a completely new kind of deal for Peru in that it is practically a turnkey contract. According to the agreement, British Smelter will be acting as Minero Perú's agents in virtually all aspects of the development of the mine, including financing, plus economic-technical studies, supervision, purchase of equipment, subcontracting, and supervision of subcontractors. Once the mine has been handed over to Minero Perú as a producing concern, there will be a 12-month maintenance period during which British Smelter will be in charge of making sure that all goes well. Financing is to be provided by Williams and Glyn's Bank of London and the Royal Bank of Canada. The money is to be loaned to Minero Perú rather than to the consortium. Late in the year, Minero Perú purchased an ion-exchange pilot plant from the Duval Corp. The facility, which had been used to extract electrolytic copper from oxide ore at the Esperanza mine in Arizona, was dismantled and shipped to Minero Perú for installation at the Cerro Verde deposit.

Continuation of the major private copper mine development was assured, at least until the end of 1972, when SPCC submitted its financing and work schedule for the next major phase of its $418 million Cuajone open pit copper mine. Following expenditures of $29.2 million on the preliminary stage 1, which lasted 18 months ending in September, 1971, work on stage 2, a 15-month period ending in December 1972, was underway with budgeted expenditures of $48.5 million. The main features of the first stage of the preparation of Cuajone had been general in scope: A start was made on everything—roads, electricity transmission, preparation of new townsites, searching for new water supplies, premine stripping, and work on 27.5 kilometers of tunnels for the railroad connecting Cuajone with the present Toquepala-Ilo industrial railroad. The scope of the 15-month stage 2 covers continuations of the railroad tunneling, extension of transmission lines and water supplies to the two main townsites, continuation of investigations for permanent underground water supplies (the present temporary supply comes from the Rio Torata), continuation of premine stripping with about 40 million tons scheduled for this stage, primary excavation work for the concentrating plant, and the initiation of permanent construction for the mine shops and related installations and on permanent construction and services for both townsites. The main problem connected with Cuajone, however, is not one of physical development but rather the development of financing for the project. The fact that SPCC has filed its investment schedule for the coming work-year does not mean that the company has been able to arrange the international financing it will eventually need for the project. Despite the efforts of SPCC to secure outside financing, there has been relatively little interest shown among Japanese and European, much less United States, investors to risk their money in Peruvian mining. A Japanese consortium of four or five companies was originally scheduled to come to a decision in August as to whether or not to help back the project but at yearend was reportedly awaiting the appearance of the detailed regulations to the new general mining law before making its decision. Meanwhile SPCC is going ahead on funds obtained from its own resources, including a substantial tax-free reinvestment allowance from the company's highly successful Toquepala mine nearby.

The Cía. Minera del Madrigal was near completion of its $10 million copper-lead-zinc mine at yearend. Production of concentrates was expected to start on schedule in January or February of 1972. The Madrigal project, though not of a considerable size compared with others in Peru of recent years, has the distinction of being the only important new private mining venture, apart from SPCC's Cuajone, on which construction and development was actually underway during the year. The financing of the $10 million required for the project is provided by the initial capital of Cía. Minera del Madrigal of $760,000 and a loan from Marubeni Iida Co., Ltd., of Japan, of $6.5 million, with the remainder of the funds being provided by Cía. Madrigal, the general partner in the enterprise, a subsidiary of Homestake Mining Co. Estimated production will be 12,300 tons of copper concentrate, 10,000 tons of lead concentrate, and 12,300 tons of zinc concentrate, which are under sales contract to Toho Zinc Co., Ltd., of Japan, on a long-term basis.

Minero Perú has indicated that it would go ahead on its own in developing the Tintaya copper deposit, one of four concessions taken from Cerro-Peru last year. Mine development will require an estimated investment of $33 million but Minero Perú has not disclosed when the mine would be developed or how it would be financed. Production was tentatively scheduled to start at the rate of 20,000 tons per year. The deposits are located south of Cuzco with the nearest railhead being at Sicuani, some 400 kilometers from the port of Matarani.

At the request of the Minister of Energy and Mines, a delegation of Japanese experts arrived in December to inspect the Michiquillay copper field in northern Peru. This former concession of The American Smelting and Refining Company has reserves estimated at 500 million tons of 0.72 percent copper. The Japanese group will spend 3 weeks visiting the property after which they will submit a report to the Peruvian and Japanese Governments.

SPCC continued to be the principal copper producer in Peru and, at the beginning of 1971, held concessions to three mineral deposits—Toquepala, Cuajone, and Quellaveco—located about 75 miles inland from the southern port city of Ilo where the company also operates a smelter. Early in January the Government declared SPCC's Quellaveco concession to have lapsed and reverted to the state for failure to assure development financing by the end of 1970 as required by law. The concession was then assigned to Minero Perú for development.

During the year, approximately $18 million was spent on the development of the Cuajone orebody, bringing the total investment at yearend to $45,664,000 including mineral land. In June the Government approved a 15-month work program to begin October 1 involving the expenditure or commitment of approximately $48 million of SPCC's own funds by December 31, 1972. Additional details pertaining to the development work at Cuajone have been given above.

Toquepala, a large open pit mine containing low-grade copper and molybdenum ores, was the only SPCC property currently in production. Lower world copper prices, plus loss of production due to numerous strikes, resulted in a 5-percent decrease in copper output in spite of the higher ore grade mined, and a 30-percent decrease in net earnings. The general mining law established the Government agency Minero Perú as the sole marketer of copper, effective October 14. However, at yearend copper was still being marketed through normal channels except for about 13 percent of the blister copper production which had been committed by the Government of Peru to the People's Republic of China. Salient statistics for SPCC operations for the years 1969–71 follow:

	1969	1970	1971
Ore and waste mined .... thousand metric tons..	58,333	62,010	52,250
Ore treated .... do....	11,980	13,896	12,466
Ore-to-waste ratio	1:3.9	1:3.5	1:3.2
Copper content of—			
Ore milled .... percent..	1.18	1.14	1.21
Blister produced .... metric tons..	121,774	129,631	123,038
Molybdenum concentrates .... do....	295	1,049	1,419

Cerro-Peru maintained its position as the second largest copper producer and the major producer of other nonferrous metals. For the first time in many years, Cerro operations in Peru were unprofitable. A total of 35 strikes by various unions during the year resulted in lost production of metals and concentrates having an estimated gross sales value of $30 million. Wage increases and benefits awarded by the Peruvian Government to end these strikes increased labor rates substantially. Strikes throughout Cerro's operations caused the loss of more than 375,000 man-days of production during the year. The reasons were many and varied but were dominated by a political power struggle on the part of different unions. In October, 15 unions went on strike for approximately 18 days causing the most severe production interruption of the year. This strike was terminated only by the armed intervention of police. In an attempt to improve earnings, Cerro closed its depleted coal mine at Goyllarisquisga in December and filed requests with Peruvian authorities to close the zinc leach residue pilot plant and the indium plant at the La Oroya smelter. By agreement with Minero Perú, the Cerro Sales Corp. acted as agent in the sale of most of Cerro's nonferrous metals and minerals. However, the company was instructed by the Government to reserve 17,500 tons of copper wire bars and 10,000 tons each of electrolytic zinc and lead for shipment to the People's Republic of China under a contract negotiated directly by the Peruvian Government.

Cerro presently operates six metal mines, seven concentrators, and a smelting and refining complex which is one of the most diverse and complex metallurgical treatment facilities in the world. Shown below is a tabulation of the principal metal and mineral production of the Cerro-Peru operations.

	1969	1970	1971
Copper .... metric tons..	47,959	47,726	44,559
Lead .... do....	77,539	71,960	68,010
Zinc:			
Refined .... do....	62,359	68,791	57,393
In concentrates .... do....	74,359	61,529	79,931
Bismuth .... do....	652	763	601
Silver .... thousand troy ounces..	18,532	20,823	19,191

Production was begun by the Cía. Minera Atalaya, S.A., at its copper mine at Yauri, Espinar Province, in the Department of Cuzco. A flotation mill processes 200 tons of ore per day and is to be expanded to 300 tons per day in 1972. The mine has a proven reserve of 500,000 tons of 3 to 3.5 percent copper. The mine is being worked from two levels at 35 meters and 70 meters below the surface. Mill production is at the rate of 500 tons per month of 35 percent copper concentrate. Shipments of 1,000 tons of concentrate are trucked every 2 months to the railhead at Sicuani, 12 hours from the mine site. All sales of concentrate have been made through Minero Perú, and production has been sold through the end of 1972.

Iron Ore.—By the end of the year, the Marcona Mining Co. had completed a good part of its $26 million expansion program aimed at increasing capacity to 10.5 million tons by June 1972. Several of the planned developments were completed and functioning. These included the installation of auxiliary diesel generators, the replacement of old dock piles with new and stronger ones, the addition of sulfide flotation units, and the construction of a bentonite grinding plant. The two major items under construction at yearend were the extension to the concentrating-pelletizing plant and the installation of a 27-megawatt steam turbine generator. The concentrating plant has been equipped with six rod mill-ball mill-magnetic separation-sulfide flotation lines, and under the development program, two new lines are being added, and one low-capacity line is being replaced with a larger unit. An additional thickening tank is to be constructed also.

During 1971, 9,291,882 tons of iron ore products were shipped from the port at San Nicolas. About two-thirds of this quantity was concentrates; the remainder was pellets. The total shipments, which were loaded out in 191-vessel-cargoes comprised 9,010,141 tons for export and 281,741 tons for domestic consumption in Peru. The distribution of iron ore deliveries has the following approximate breakdown: Japan 80 percent, United States 13 percent, Europe and others 5.5 percent, and domestic 1.5 percent. During the year, the Nippon Steel Co. of Japan announced that it was cancelling an order for the purchase of 6,750,000 tons of Marcona's iron ore. The reason given for the cancellation of the contract was the high sulfur content of the ore which caused air pollution during the smelting step in Japan. During the year, the company suffered 38 days of strikes and lost approximately 1.1 million tons of production. Marcona also faced increased competition from newly developed mines on the west coast of Australia. These mines produce high-grade ores and have the advantage of being much closer to Japan, the principal customer.

Iron and Steel.—The Minister of Industry and Commerce in a speech on January 25, 1971, announced several projects for the steel industry under a 5-year plan for 1971–75. Among these were the expansion of the Chimbote steel complex, scheduled to have an annual output of 1.5 million tons by 1975 at a cost of $103.4 million; a $134.4 million steel complex at Talara, with a projected output of 1 million tons by 1976, which would use natural gas from the Talara petroleum installations; and a complex at Nazca, scheduled to have an annual output of 1.5 million tons by 1976 and 5 million tons by 1980, at a cost of $620.2 million.

Activity in the steel sector increased markedly toward the end of the year. In November, the Government established SIDERPERU to handle the country's iron and steel production and marketing. As part of the authorized capital of approximately $300 million, SIDERPERU absorbed SOGESA, the former operator of the Chimbote steel plant. On December 4, a $70 million steel sheet rolling mill was inaugurated at the Chimbote plant. The new mill, which will play an important part in increasing the complex's annual output to 1.5 million tons of finished products, was built by a Franco-Italian consortium, and has an initial capacity of 150,000 tons per year of rolled steel. The plant will supply the needs of the growing domestic market for steel plates. In 1972, the mill is scheduled to start turning out thick steel sheets for the country's expanding shipbuilding industry. Inputs to this and other industries consuming sheet steel have previously been imported, and domestic production is expected to result in substantial savings in foreign exchange.

The new facilities include the following: four soaking pit furnaces, each with a capacity of 80 tons; a reversible rolling mill with a capacity of 1.4 million tons per year; a slab oven with a capacity of 100 tons per hour; and a Steckel rolling unit capable of producing 60 tons per hour of sheet steel, or 432,000 tons per year. There is also a descaling unit, a reversible four-stage cold-rolling mill with a production capacity of approximately 150,000 tons per year; three annealing ovens for steel rolls; a Senzimir-type galvanizing facility with a production capacity of 4 tons per hour of both smooth and corrugated galvanized steel sheets; a heat-treatment oven for 10 tons of thick sheets per hour; and various cutting equipment for hot-rolled and cold-rolled coils and thick sheets. The new mill is expected to fill 60 percent of domestic steel requirements by 1972 and 80 percent by 1973.

SIDERPERU's duties include the carrying out of the Government's objectives for the steel industry as formulated by the Ministry of Industry and Commerce and the National Planning Institute. Expansion of the Chimbote plant is the first stage of the plan. Future developments include the complexes at Nazca and Talara. Both of these are still in the very early planning stage, although a Japanese technical mission arrived in November to make preliminary studies for the Nazca project.

Lead and Zinc.—Minero Perú reached agreement with the Mexican company Metalúrgica Mexicana Peñoles, S.A., to refine more than 100,000 tons of Peruvian lead concentrates. Shipments were scheduled to start from Peru in September and extend into 1975. A Minero Perú spokesman indicated that the Cerro Sales Corp. would act as its exclusive agent for the sale of the metal, except in cases involving direct sales on a government-to-government basis.

The Cía. Minera Santa Louisa, S.A., operated a 750-ton-per-day differential flotation mill at its Huanzala mine at capacity during the year and produced concentrates of lead, zinc, and copper. The lead and zinc concentrates were exported to Japan while the small copper production was sold to Cerro-Peru. The Mitsui Mining and Smelting Co. of Japan, owner of Santa Louisa, plans to increase the zinc and lead ore production by 50 percent by 1973. Ore reserves at Huanzala have been estimated at 2 million tons assaying 13 percent zinc, 7 percent lead, and 1 percent copper.

Cía. Minerales Santander, Inc., an affiliate of St. Joe Minerals Corp., produced 73,759 tons of zinc concentrate and 11,358 tons of lead concentrate from milling underground ore. Comparable tonnages for 1970 were 75,370 and 10,809, respectively.

NONMETALS

Fertilizers.—The contract signed on June 8 between Petroperu and the Toyo Engineering Corp. of Japan for the construction of a fertilizer complex in Talara was partially amended in accordance with a loan agreement from government-to-government, between Peru and Japan, which was signed on February 2, 1972. The amendment of the financing clause is favorable for Peru as it provides for a 20-year repayment period, with a grace period of 5 years. Interest will be at the rate of 5.5 percent per year on outstanding amounts. The previous agreement with Toyo Engineering called for a repayment period of 11 years, and semiannual installments, with an interest rate of 6.5 percent and a grace period of 3 years. The total amount of the loan for the Talara project is approximately $44.2 million, up more than $14 million from the previously announced figure. The increase reportedly will cover local expenses in Peru, complementing the original supplier credit of $30 million. Petroperu will invest an additional $9.2 million on infrastructure.

The Talara plant, which should be in operation by the beginning of 1974, is to use 10 million cubic feet of natural gas a day from the northwestern petroleum fields, to produce 300 tons of ammonia. This in turn will be converted to 510 tons per day of urea. The complex is to consist of an ammonia plant, a urea plant, a 54,000-kilowatt thermoelectric plant, and a plant for the treatment of salt water. The fertilizer complex is being constructed between Playa Las Peñitas and Malaca, about 500 yards from the Talara oil refinery. With the completion of the new complex, Peru expects to satisfy its increasing domestic demand for nitrogenous fertilizers and save $10 million which at present is spent to import fertilizers.

The Kaiser Aluminum & Chemical Corp. announced in September that it would relinquish its interest in Minera Bayovar, S.A., an 80-percent-owned subsidiary with phosphate and potash mining claims and concessions in the Sechura Desert on the coast of Peru. The termination of the Kaiser interest became effective in October and resulted in a nonrecurring book loss of about $7.5 million. The company announced that the depressed condition of the worldwide phosphate market made it impossible to comply with provisions of the general mining law calling for submission of specific development plans by November 10 and the start of construction and completion of financing in the first half of 1972. On December 30, the Director General of Mines declared that all mining concessions belonging to Minera Bayovar, S.A., had reverted to the state on that date for failure to submit its calendar of operations as required by law.

MINERAL FUELS

In marked contrast to the reluctance of foreign metal mining companies to invest in Peru, the international petroleum companies were standing in line to obtain operations contracts at yearend. The importance to Peru of this exploration boom can hardly be overestimated if it is considered that during the year there was a crude petroleum shortage of about 35,000 barrels per day, resulting from a consumption of about 100,000 barrels per day of petroleum products and a production of only 65,000 barrels per day. In addition, consumption is increasing at the rate of about 10,000 barrels per day annually. Production of crude petroleum in 1971 was at the lowest level since 1963.

In the latter half of 1970, Petroperu, the state oil company, launched a $36 million exploration program, the largest ever to be undertaken in the country. The major thrust of this exploration program was to be in the northern and eastern jungle areas with about 70 percent of expenditures and effort concentrated on the Ecuadorean-frontier zone. Following several months of preparation and geophysical exploration, Petroperu spudded in its first wildcat, Corrientes X-1, on September 3. This first exploratory well became successful with the discovery of oil on November 16. Tested at 9,850 feet, the well flowed at about 3,000 barrels per day of good medium-gravity crude. Seismic and other tests show that the Trompateros field where the Corrientes X-1 is located, is an anticline structure of between 5 and 15 kilometers in size with a structure closure of around 90 meters. It appears that the well contains 82 gross feet of productive sand and therefore may have uncovered a reserve of approximately 300 million barrels. On December 10 Petroperu started drilling its second well in the Amazon Basin, 60 kilometers northwest of Trompateros. The new well, Capirona X-2, like its predecessor is near the Corrientes River.

Contractors for Petroperu in the jungle are the Parker Drilling Co. of Tulsa, Oklahoma, working under a 2-year contract, and Schlumberger Suenco, who are carrying out the electronic analysis. Prakla-Seismic, of Hannover, West Germany, and Geophysical Services, Inc., of Dallas, Texas, are doing the seismic exploration work on 30-month contracts. Petroperu has budgeted $10 million a year for jungle exploration in the 1971–73 period. A smaller exploration program budgeted at $2 million per year for the 3 years is also being carried out by Petroperu in Peru's traditional northwest coastal fields around Talara. At yearend Petroperu was drilling a second exploratory well in this area after having completed an unsuccessful well earlier.

The Belco Petroleum Corp., Peru's largest independent crude producer, whose oil comes from offshore wells on Peru's northwestern coast, began a 2-year $23.7 million exploration and drilling program. The program calls for drilling 56 wells from six deep water drilling platforms. The wells will be drilled to depths varying between 2,000 and 9,000 feet below the seabed in water depths of up to 220 feet compared with a maximum depth for the company's present 17 platforms of 140 feet. The deep water drilling platforms were designed and installed for Belco by Brown and Root Overseas, Inc., of Houston, Texas. Each platform will contain about 600 tons of steel and will be constructed on the beach at Talara. Upper and lower decks will be built in one piece. It is expected that all six platforms would be in place by yearend.

Table 5.—Peru: Distribution of crude petroleum production by zone and company

(Thousand 42-gallon barrels)

Zone and company	Production	
	1970	1971
CONTINENTAL SHELF		
Belco Petroleum Corp. of Perú	9,882	7,849
Petróleos del Perú	74	54
Total	9,956	7,903
COASTAL		
Belco Petroleum Corp. of Perú	42	51
Petróleos del Perú, Los Organos	838	(1)
Petróleos del Perú, Lima concession	10,181	9,316
Petróleos del Perú, La Brea y Pariñas	4,363	4,478
Petrolera Amotape, S.A	6	(1)
Total	15,430	13,845
EASTERN		
Compañía de Petróleo "Ganso Azul", Ltda	469	408
Compañía Peruana de Petróleos "El Oriente", S.A	414	432
Total	883	840
Grand total	[2]26,269	22,588

[1] Production figure included in "La Brea y Pariñas."

[2] Total excludes an additional 4,000 barrels not reported by origin in original sources.

The Texas Petroleum Co. and Occidental Petroleum Co. completed and abandoned two offshore wildcat wells during the year in an area about 60 miles offshore of Trujillo, on the northern coast. The data accumulated from the two wells were being evaluated at yearend, and additional drilling may be undertaken at a later date. Occidental was the operator and also financed the drilling program on the two companies' concessions which were pooled for the purpose.

In June, Occidental signed a "model contract" with Peru which triggered an onshore wave of activity. American companies and international companies joined in a mad race to get the liberal contract concessions that Peru was offering for exploration and development in the jungle areas. The contract signed with Petroperu is for 35 years and drops all mention of the word concession. Instead, Occidental has undertaken to do exploration in a specific Petroperu-assigned area, and all oil found in this area will be split 50–50 at the wellhead. Occidental agreed to pay all costs of exploration, drilling, and development. Apart from a few comparatively minor taxes on capital invested, social security, etc., Occidental will pay no taxes, this being taken care of by Petroperu.

The contract assigns Occidental an exclusive area of 1,166,716 hectares in a block made up of 61 parcels which run along the Peru-Ecuador frontier which forms the northern boundary of the block. Exploration of the area was to begin within 6 months. The first 4 years of the exploration program was to consist of photogeological studies, seismic, geological, and geophysical studies, and the drilling of at least three exploration wells. The exploration period can then be extended 3 more years provided Occidental drills one well every 5 months between the 54th and 84th months. The contract will terminate if commercial quantities of oil have not been found by the end of 7 years. A committee composed of two representatives of Petroperu, two from Occidental, and one from Peruvian military, will supervise operations under this contract. However, Occidental will be in sole charge of its operations during the period of the contract though it must supply any information required by Petroperu in carrying out its supervisory responsibilities. Such information will be considered classified and not releasible to third parties without the prior consent of Occidental and Petroperu. Occidental is authorized to hire such foreign personnel as it deems necessary but is also committed to train Peruvian personnel.

When and if production reaches 100,000 barrels per day, Occidental will lay a pipeline which, after 15 years, would be turned over to Petroperu at no cost. Petroperu has the option of a minimum 50-percent participation in construction of the pipeline if it so desires. Petroperu will have first priority to purchase Occidental's 50-percent share in the crude oil and/or gas, if required to cover internal Peruvian demand. Any income tax payable by Occidental would be included in Petroperu's 50-percent share of the crude and is not to be at less than the present rate: 25 percent during the first 10 years beginning with the first sale of crude by Occidental, 35 percent during the next 10 years, and 50 percent during the remaining years of the contract.

By the end of October, Occidental was preparing to move 700 men into the jungle-contract area. An advance party of 70 men was already hacking out a base camp to be used by seismic crews prior to drilling. Two Petty geophysical crews had been contracted to work for 2 years in the area. Plans called for the establishment of a base camp to be located on the Rio Corrientes, midway between the north and south borders of the contract area and midway between the Rio Tigre and Rio Pastaza. Supplies will move up river from Iquitos on the Amazon for much of the distance and then by riverboat or plane to the camp. A Parker Drilling Co. rig will move by ship from Houston, Texas to Iquitos. If the rivers are high enough, they will be used to move the rig to the camp; otherwise, planes will be required.

According to press reports, the program, excluding a pipeline if built, will cost Occidental about $50 million. A joint venture of Union Oil and Tenneco Oil Companies signed a contract on September 20 with Petroperu for the exploration of 400,000 hectares in a series of blocks offshore of Peru's far northern coast along the border between Peruvian and Ecuadorean territorial waters. Tenneco and Union are joint equal partners in the deal with Tenneco being the operating partner. The offshore contract was almost exactly the same as the jungle contract signed between Occidental and Petroperu in June. However, the joint enterprise was committed to a stepped-up program with first drilling obligatory within 6 months. All oil found was to be split 50–50 between Petroperu and the joint enterprise with Petroperu paying the consortium's taxes plus its own. Tenneco spudded the first well on October 10, about 20 miles offshore in the comparatively shallow water depth of 165 feet. On October 13, an explosion seriously damaged the offshore drilling platform being used. The explosion caused five deaths, four injured, and three missing. The workers were apparently preparing to set 20-inch surface casing at about 500 feet when a gas blowout occurred.

The Union-Tenneco consortium signed a contract with Petroperu on October 13 for exploration and development of approximately 1 million hectares in the northeastern jungle, part of it running along the Ecuadorean frontier. The area is actually wrapped around the eastern end of the area assigned to Occidental Petroleum. Terms of the contract were similar to those of the Occidental contract except for the percentage distribution of any crude oil found. Whereas Occidental is to receive 50 percent of any production, Union-Tenneco will receive on a yearly basis: 50 percent of production under 100,000 barrels per day (yearly average); 49 percent when production runs between 100,000 and 200,000 barrels per day; and 48 percent when production exceeds 200,000 barrels per day. Petroperu, of course, will receive the higher percentage.

On November 19, Petroperu signed an operating contract with the British Petroleum Co. for exploration and exploitation of an area of slightly more than 1 million hectares in the Department of Loreto about 250 kilometers south of Petroperu's successful wildcat venture. The contract was identical to the contract signed by Tenneco-Union.

At yearend, a petroleum boom was beginning to build as industry sources calculated that between $800 million and $1,000 million would be spent during the next 7- to 8-year period in the exploration and development of Peru's section of the oil-bearing Marañon-Pastaza basin which contains Petroperu's first successful wildcat. Following the three operations contracts that had been signed by yearend, there were seven more due to be signed within the following 3 months, and discussions were well advanced with other groups. Companies about to sign contracts with Petroperu were given as Getty Oil, ERAP (France), Phillips Petroleum, Sun Oil, Amoco/Shell, Atlantic Richfield, Superior Oil Co./Austral Oil Co. consortium, Gulf Oil, and a Cities Service/Caymann Oil consortium.

Decree Law 17440 of February 1969 abolished the system of petroleum concessions in Peru and established the system of operating contracts. However, the bases for these operation contracts were not made public until May of 1971. On June 15, Decree Law 18883 was published and authorized Petroperu to enter into contracts for exploration and exploitation of petroleum with national and/or foreign companies within 50 kilometers of the Peruvian border. This law was followed by Decree Law 18890 of June 17 which authorized the Central Reserve Bank of Peru to be a party to contracts between Petroperu and foreign oil companies concerning new investments in Peru. The Central Bank was authorized to guarantee the availability of foreign exchange to such companies to cover the proceeds of their exports and/or domestic sales and services during the period of their contracts, to remit abroad authorized net profits, depreciation, and other justified outflows, and to remit amortization payments and interest on foreign loans contracted to finance their Peruvian operations. However, remittances during any given year were not to exceed the amount of net profits plus depreciation applicable to that year. Through Decree Law 18939 of August 24, the Government provided for the exemption of all import duties and charges including the 1.5 percent ad valorem tax on duty-free imports, the 3 percent ad valorem additional import tax, and the 8 percent consular fees, for a period of 8 years on machinery, drilling equipment, oil well derricks, pipes, tanks, tools, and other materials imported exclusively for oil exploration throughout the national territory. In order to enjoy these duty-free privileges, interested parties must submit to the Directorate General of Hydrocarbons of the Ministry of Energy and Mines the respective calendars of investments for the execution of exploratory drilling. The duty-free equipment and materials also may be used in exploitation areas, subject to prior authorization by the Directorate General of Hydrocarbons, in which case the beneficiary must reimburse the corresponding percentage of customs duties.

Also during the year, the Government issued Decree Law 18930 of August 17, decreeing monopoly rights for Petroperu in imports of crude and products. Conchan/Chevron, a Standard Oil Co. of California subsidiary, which operates Peru's only significant private refinery, was principally affected by the Decree. The company will have to buy its imported crude from Petroperu and presumably would not benefit from the tariff exemption granted to the national company. Conchan/Chevron thus will lose the advantage of buying crude at favorable terms from its affiliate and 50-percent owner, Standard Oil of California. Lubricant companies are not expected to be affected by this Decree since the base oil and additives they blend at their local plants are not classified as derivatives under Peru's petroleum law.

Production by Belco Petroleum, the principal private producer, decreased by 2,024,000 barrrels during the year. Production by Petroperu and other private companies also decreased. Contributions to the total supply were 61 percent from the coastal area, 35 percent from the Continental Shelf, and 4 percent from the eastern zone. Practically all production of natural gas came from the coastal and offshore areas. Data on the production of natural gas by fields were not available but other pertinent data follow:

	1970	1971
Production of natural gas million cubic feet	75,182	67,227
Liquefied gas do	2,861	2,303
Used as fuel do	13,961	14,632
Used in gas-lift do	14,273	14,575
Returned to oilfield do	7,230	6,442
Flared or otherwise lost do	36,493	29,273
Utilization percent	51.2	56.5
Flared or otherwise lost do	48.8	43.5

Refinery output increased almost 10 percent largely as a result of improved output of the Petroperu refineries. The following tabulation of refinery runs shows production for 1970 and 1971, in thousand 42-gallon barrels:

	Motor gasoline		Kerosine		Diesel		Residual fuel		Other	
	1970	1971	1970	1971	1970	1971	1970	1971	1970	1971
Petróleos del Perú:										
Talara	5,902	6,557	3,448	3,715	4,759	5,249	4,561	5,236	1,153	1,015
La Pampilla	2,414	2,718	145	161	1,110	958	1,615	2,385	1,362	1,423
Iquitos	84	69	67	81	99	139	113	121	4	(1)
Refineria Conchan-Chevron, S.A	1,004	988	240	295	593	524	1,366	1,492	192	206
Cía. de Petróleo Ganso Azul, Ltda	119	101	63	62	158	136	110	96	1	2

(1) Less than 500 barrels.

The expansion from 20,000- to 30,000-barrels-per-day capacity of Petroperu's La Pampilla refinery was inaugurated officially on June 18. The initial construction and the expansion of the refinery was performed by the Japanese company, Marubeni Iida, and Japan Gasoline Co. In accordance with its project to modernize the Talara refinery, Petroperu carried out an economic-technical feasibility study for the installation of a 16,600-barrel-per-day catalytic cracking unit and submitted the study to the Ministry of Energy and Mines and the National Planning Institute for approval. By Ministerial resolution of July 23, the study was approved, and Petroperu was authorized to issue a call for bids and financing for the $11.3 million project. Seventeen foreign companies were interested in the project, and from these Petroperu selected four, as follows: Snam Prageti (Italian), Marubeni Iida and Japan Gasoline (Japanese), Gexa (French), and Brefco International, Ltd. (English). These four companies were to submit their formal proposals later in the year based on specifications provided by Petroperu.

Consumption of petroleum products in Peru has nearly doubled over the past decade according to government statistics. In 1960, petroleum consumption was 18,513,000 barrels, and in 1970 it was approximately 35 million barrels. Estimated consumption for 1971 was 37,500,000, while consumption for 1975 has been estimated at 44,500,000 barrels. Four refinery products accounted for 92 percent of refinery output. Production of these products in million barrels was as follows: motor gasoline, 10.4; residual fuel oil, 9.3; diesel oil, 7.0; and kerosine, 4.3. Domestic sales of these products, were, in million barrels, motor gasoline, 10.8; residual fuel oil, 10.5; diesel oil, 6.4; and kerosine, 4.3.

The Mineral Industry of The Philippines

By Brinton C. Brown[1]

Philippines' mineral production value reached another alltime high of $313 million[2] in 1971, surpassing the previous 1970 record of $268 million by 14 percent. Despite the decline in world market prices of copper concentrates, the Philippines' leading mineral commodity, mine output value increased 16.7 percent; whereas the gross national product (GNP) gained only 6.5 percent based on constant 1967 prices. Mineral production continued to make an increasing contribution to the overall economy of the country.

Copper production, accounting for 61.5 percent of the total mineral value, was the largest in the Far East and ranked eighth in the world. Copper reserves exceed 1.5 billion tons averaging 0.5 percent copper. During the year Atlas Consolidated Mining & Development Corp., one of the 10 largest copper producers in the world, increased its output capacity 80 percent. Curtailed imports of copper concentrates by the Japanese and the imposition of an antipollution smelting charge of 1½ cents per pound of copper recovered have moved all copper producers to seriously consider establishing a smelter in the Philippines.

Although chromite production decreased 24 percent, the country still ranked fourth in world production and was the leading exporter of refractory chromite to the United States.

Gold recovered by primary producers and as a byproduct from copper flotation was the highest since 1941 and ranked seventh in the world. The value of precious metal production was 8.4 percent of the total value of mineral production for the country.

Commercial production of nickel and cobalt from nickeliferous laterite on Nonoc Island was scheduled for July 1974. Marinduque Mining and Industrial Corp. (MMIC) completed financing arrangements to build the $232 million plant to produce 75 million pounds of nickel annually, and proceeded with mine development and plant construction. Acoje Mining Co., Inc. exported nickel-cobalt concentrates containing platinum and palladium produced from its dunite deposit.

The value of nonmetallic mineral production, dominated by portland cement, was 21.3 percent of the total mineral value. Most of the nonmetallic minerals were for domestic consumption.

Philippines Explosives Corp., a joint venture between Imperial Chemical Industries Ltd. of England and four Filipino firms, was constructing a factory for a complete line of commercial explosives at Limay, Bataan, with an annual capacity of 5,000 tons.

The Philippines had one of the highest inflation rates among Asian countries with consumer prices rising 23 percent in 1971. Inflation and restrictive credit had a curtailing effect on investment in new industrial facilities. Nevertheless, the results of a survey of U.S. firms with direct investments in the Philippines conducted in 1971 indicated that 148 companies plan to invest a total of $262 million in the country between 1971 and 1973. Nearly 60 percent of the planned investments are in the mining industry. One company, Atlas Consolidated accounts for more than one-half the total and nine other mining companies account for another 28 percent. Three American-controlled mining firms in the Philippines registered 53.8 percent return on the stockholders equity in 1970 compared with 13.8 percent posted by the U.S.-based mining companies. Oil companies in the Philippines performed poorly with 7.8 percent return compared with 10.3 percent posted by their parent companies in the United States.

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[1] Mining engineer, Division of Nonmetallic Minerals.

[2] Where necessary, values have been converted from Philippine pesos (PP) to U.S. dollars at the rate of PP6.43=US$1.00.

American mining companies were disinvesting to comply with the constitutional requirement that corporations engaged in developing natural resources should have 60-percent Filipino ownership after the expiration of the Laurel-Langley Agreement on July 3, 1974. Atlas Consolidated increased Philippine ownership from 41 to 45 percent during the year. Filipino ownership in Marcopper Mining Corp. was 29 percent. Lepanto Consolidated Mining Co. was already divested, with 69-percent Filipino ownership. Benguet Consolidated Inc. raised Philippine equity from 1.5 to a total of 3 percent. In August, the Securities and Exchange Commission approved Benguet's plan to form two companies separating Philippine assets from overseas assets.

Republic Act No. 6173, a law creating the Oil Industry Commission. was signed April 30, 1971. Powers of the Commission, having jurisdiction over all aspects of the oil industry, include the right to control prices, regulate refinery capacities, prevent monopolistic practices, operate refineries in the National interest, and review prices of crude oil imports. On July 6, following protests from students and strike threats by jeepney drivers, the Supreme Court directed all oil companies to reduce prices of gasoline and other petroleum products instituted by the companies on July 2 at the expiration of the Price Control Law. The order stipulated return to January 28 price levels which were 4.8 cents per liter of regular gasoline and 3.6 cents per liter of kerosine.

On December 3 the Oil Industry Commission denied motions for a provisional price increase on petroleum products ranging from ½ to 1 cent per liter, by Caltex Philippines, Inc., Shell Philippines, Inc., Esso Philippines, Inc., Mobil Oil Philippines, Inc., Filoil Refinery Corp. (Gulf), and Getty Oil (Philippines), Inc., despite information that Indonesia planned to increase the price of crude oil by $0.40 by the end of 1971.

Oil firms claim an average loss of $31,100 per day in customs duties to the Government as a result of a 1970 ruling issued by the Customs Commission compelling oil firms to pay customs duties on crude oil imports including sediments and water, which average about 0.4 percent.

On July 1 new rates went into effect under the Export Tax Law, reducing the tax on copper ore and concentrates from 10 to 8 percent and the tax on iron ore and concentrates and chromite ore and concentrates from 8 to 6 percent.

National Power Corp. (NPC), owned by the Philippine Government, has contracted the services of Philippine Geothermal Inc. (PGI), a subsidiary of the Union Oil Co. of California, to undertake exploration and exploitation of the geothermal power resources in Albay. PGI will determine for NPC the geothermal potential of the area and, if feasible, render service to NPC in the development, operation, and utilization of the geothermal resources. NPC plans to construct a 50,000 kilowatt electric powerplant using geothermal steam energy. PGI in a joint project with the Philippine Commission on Volcanology built a pilot geothermal power generating plant at Tiwi, Albay, and estimated the potential for expansion of power generation could be 300 to 500 megawatts.

Manila Electric Co. (Meralco) has programmed construction of six powerplants over the next 10 years with a total generating capacity of 1,980,000 kilowatts. The Snyder Unit No. 2 was scheduled for completion in May 1972 and the Montelibano Unit No. 1 for September 1973, each with a capacity of 330,000 kilowatts. In 1970 the company reported sales of 4.6 billion kilowatt hours, a 4.2-percent increase over the previous year, from operation of three hydroelectric stations and 17 thermal powerplants with a total generating capacity of 1,191,000 kilowatts.

NPC completed a feasibility study and plans to construct a second thermal unit in Bataan Province with a capacity of 150 megawatts. NPC plans to install the final 50-megawatt unit at Maria Cristina Falls on the Agus River in Agusan, Mindanao, increasing the capacity of the hydroelectric plant to 200 megawatts. The short river draining Lake Lanao over a steep course has six more generating sites with a total potential of 750 megawatts. Construction was planned to start in 1972 for a 100-megawatt hydroelectric plant at Pantabangan Dam on the Pampanga River in Mountain Province.

PRODUCTION

Base metals accounted for the bulk of the Philippine mine output value in 1971. Copper dominated with 61.5 percent of the total mineral production value, followed by gold at 8 percent, iron ore at 5 percent, chromite at 3 percent, and mercury at 1 percent. Portland cement with a value of about 10 percent of the total was the only nonmetallic commodity of consequence.

In addition to mineral output value, the value added related to imported materials was substantial with regard to petroleum products.

In terms of relative world significance, the Philippines ranked eighth in copper output in 1971, fourth in chromite production (actually first in refractory chromite), seventh in gold, thirteenth in mercury, and within the top 20 in silver output.

Table 1.—Philippines: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971[p]
METALS			
Cadmium mine output, metal content kilograms	[r] 4,128	4,990	9,843
Chromium, chromite, gross weight:			
Metallurgical grade	112,175	99,933	87,076
Refractory grade	357,256	466,510	345,132
Total	469.431	566,443	432,208
Copper mine output, metal content	131,426	160,296	197,573
Gold troy ounces	571,145	602,715	637,048
Iron and steel:			
Iron ore and concentrate thousand tons	1,561	1,870	2,250
Ferroalloys	904	720	NA
Steel semimanufactures thousand tons	294	NA	NA
Lead mine output, metal content	67	14	--
Manganese ore and concentrate, gross weight	20,002	5,121	5,133
Mercury mine output, metal content 76-pound flasks	3,478	4,648	5,020
Molybdenum mine output, metal content	16	32	[e] 4
Nickel metal	--	103	222
Platinum-group metals:			
Palladium troy ounces	--	878	1,756
Platinum do	--	352	703
Silver mine output, metal content thousand troy ounces	1,561	1,702	1,940
Zinc mine output, metal content	3,286	3,191	3,875
NONMETALS			
Asbestos	45	1,213	[e] 1,200
Cement, hydraulic thousand tons	2,950	2,447	3,117
Clays:			
Bentonite	--	164	133
White	4,508	12,346	NA
Rock	3,842	3,177	NA
Other	165,515	240,515	335,134
Diatomite	101	51	[e] 50
Feldspar	35,391	20,236	55,827
Fertilizer materials:			
Crude, phosphatic:			
Guano	15,236	1,480	1,135
Phosphate rock	--	1,400	4,729
Manufactured:			
Nitrogenous	9,731	NA	NA
Mixed and unspecified	81,283	58,929	55,864
Gypsum and anhydrite, crude[1]	37,013	17,458	42,796
Lime	215,545	161,892	242,264
Perlite	NA	12,000	415
Pyrite and pyrrhotite (including cupreous):			
Gross weight	201,511	273,851	230,154
Sulfur content	94,509	127,012	106,745
Salt, marine	231,187	210,306	226,834
Sand and gravel:			
Sand, glass thousand tons	638	684	498
Sand and gravel n.e.s.[2] thousand cubic meters	4,308	4,619	6,272
Stone:			
Coral, crushed do	37	180	NA
Dolomite	4,826	11,011	11,488
Limestone thousand tons	3,076	3,567	3,948
Marble (dimension) unfinished	312	10,271	3,854
Tuff	105,792	87,997	59,206
Cobbles and boulders n.e.s thousand cubic meters	167	245	215
Sulfur, elemental	32	41	39
Talc	942	1,590	1,317

See footnotes at end of table.

Table 1.—Philippines: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971p
MINERAL FUELS AND RELATED MATERIALS			
Coal, all grades	53,341	42,401	40,024
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	14,561	15,601	15,771
Jet fuel do	2,416	2,703	2,116
Kerosine do	3,328	3,371	3,382
Distillate fuel oil do	12,853	13,790	14,946
Residual fuel oil do	21,337	23,517	24,528
Other do	1,744	2,048	1,898
Refinery fuel and losses do	4,271	3,784	4,472
Total do	60,510	64,814	67,113

e Estimate. p Preliminary. r Revised. NA Not available.

[1] Including synthetic.

[2] Including unspecified earths.

TRADE

The Philippines exported mineral commodities valued at more than $200 million, of which copper concentrates exceeded 90 percent. Japan was the principal customer for most mineral exports. Virtually all of the copper producers were looking for European markets as a result of curtailed importation by Japanese buyers brought about by an economic recession and reduced copper smelter operations caused by strict antipollution regulations in Japan. One shipment of concentrates was made to East Germany. Lepanto Consolidated, the sole copper exporter to the United States, experienced difficulty selling concentrates because of the U.S. dock strike, a smelter strike, and curtailed smelter operations imposed by pollution control regulations. The gold produced in the Philippines went almost entirely to the Central Bank and was not traded in the world market. All of the metallurgical chromite was shipped to Japan. The United States continued to be the principal market for refractory chromite.

Although Philippine iron ore, pellets, and magnetite concentrates were exported primarily to Japan, 25 percent of the iron, in the form of magnetite concentrates from beach sands, were shipped to the United States. Most of the mercury went to the Japanese market. Despite a huge surplus of portland cement, only a relatively small amount was exported to South Vietnam and Indonesia.

Exports of portland cement, petroleum pitch, and petroleum residue each exceeded $5 million and became subject to the 4-percent export tax set in the Stabilization Act of 1970.

The United States in 1971 replaced Japan as the Philippines primary trading partner. Japan greatly decreased its lead as a supplier of imports to $359 million, compared with $432 million in 1970, and imports from the United States fell sharply to $291 million, compared with $305 million in 1970. Although the downward trend has continued for 3 years, part of the decline in imports from the United States was caused by the west coast dock strike. West Germany was improving its trade position, as was Australia. Romania offered to aid the Philippines in oil exploration, mining, and industrial development.

On September 30, tariffs on cold-rolled strips of steel and black sheets were raised from their previous ad valorem rates of 15 percent and 20 percent, respectively, to 40 percent to protect the two small steel mills.

Table 2.—Philippines: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum metal including alloys, all forms	403	453	Thailand 139; Hong Kong 100.
Chromite ore and concentrate	515,454	596,037	United States 257,302; Japan 111,714; United Kingdom 90,043.
Copper:			
Ore and concentrate	453,073	604,352	Japan 583,795; Republic of Korea 12,307; Hong Kong 8,051.
Waste and scrap including alloys	26,695	3,954	Japan 1,779; West Germany 868; Spain 501.
Matte	14	6	All to Switzerland.
Alloys unwrought	1,527	1,997	All to Japan.
Gold bullion thousand troy ounces	529	653	United States 536; Switzerland 117.
Iron and steel:			
Iron ore and concentrate including roasted pyrites	1,609,865	1,831,905	Japan 1,815,892.
Scrap	170	200	All to Japan.
Lead ore and concentrate	--	379	All to Belgium.
Manganese ore and concentrate	36,360	5,197	Japan 4,697.
Mercury 76-pound flasks	3,132	4,495	United States 2,291; Japan 2,088.
Molybdenum concentrate	28	29	All to United Kingdom.
Nickel concentrate	--	500	All to Japan.
Platinum and silver ores value, thousands	$1,195	$54	NA.
Silver metal thousand troy ounces	336	624	Japan 472; United Kingdom 78; Hong Kong 67.
Zinc:			
Concentrate	5,805	7,694	United States 5,220; Japan 2,473.
Scrap	994	614	All to Japan.
Other metals:			
Gold, silver, and platinum-group metals, not differentiated value, thousands	$18,856	$23,844	United States $18,785.
Ores and concentrates containing more than one metal:			
Copper-gold-silver concentrates	2,250	157	All to Japan.
Lead-copper-concentrates containing gold and silver	1,144	164	All to Switzerland.
Ash, slag and other residues containing nonferrous metals	--	150	All to Taiwan.
Waste and scrap n.e.s	134	--	
NONMETALS			
Cement, hydraulic	48,646	122,968	South Vietnam 101,700; Indonesia 17,663.
Fertilizer materials manufactured	45,547	17,596	Thailand 8,180; Indonesia 6,216.
Stone, sand and gravel:			
Sand	27	1,236	Japan 1,000; Guam 200.
Gravel and crushed stone	2	19	All to Guam.
Stone, dimension, not worked	4	7	All to Japan.
MINERAL FUELS AND RELATED MATERIALS			
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	31	37	Other United States Insular Possessions 24; Guam 13.
Kerosine do	29	47	Singapore 35; Hong Kong 11.
Jet fuel do	21	80	Guam 32; South Vietnam 21.
Distillate fuel oil do	130	199	Hong Kong 94; United States Possessions 48.
Residual fuel oil do	2,258	2,014	Japan 1,758.
Other do	1,414	3,370	Japan 2,132; Singapore 796.
Total do	3,883	5,747	

NA Not available.

Table 3.—Philippines: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum:			
Alloys unwrought	16,828	8,438	United States 6,168; Australia 1,490.
Scrap	149	95	Hong Kong 67; United States 28.
Copper metal including alloys, all forms	5,729	6,068	Japan 3,318; United States 2,072.
Iron and steel:			
Iron ore and concentrate	160	5	United Kingdom 5.
Scrap	30,743	4,678	Singapore 1,790; South Vietnam 1,468; United States 1,397.
Pig iron, cast iron, powder and shot	14,928	12,435	Australia 12,312.

Table 3.—Philippines: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS—Continued			
Iron and steel—Continued			
Ferroalloys	2,778	5,116	Canada 1,388; Japan 1,129.
Steel primary forms	442,549	581,956	Japan 352,435; Australia 160,054.
Semimanufactures:			
Bars, rods, angles, shapes, sections	79,649	59,804	Japan 35,352; Taiwan 14,319.
Universals, plates, and sheets	267,727	156,508	Japan 134,363.
Hoop and strip	68,149	15,687	Japan 13,938.
Rails and accessories	2,794	3,584	Japan 1,477; Singapore 508; United States 494.
Wire	6,989	10,371	Japan 7,926.
Tubes, pipes, and fittings	34,451	39,309	Japan 32,156.
Castings and forgings	14,652	3,011	Australia 1,618; United States 1,028.
Lead metal including alloys, all forms	5,672	5,929	Australia 5,574.
Manganese ore and concentrate	4,064	4,096	All from Ghana.
Nickel metal including alloys, all forms	98	58	United States 25.
Silver and platinum metals including alloys value, thousands	$91	NA	
Tin metal including alloys, all forms	600	863	Malaysia 672.
Zinc metal including alloys	22,595	17,789	Australia 6,572; Canada 5,957; Japan 4,856.
Other ores and concentrates of nonferrous base metals	4,282	4,517	Ghana 4,096.
NONMETALS			
Abrasives:			
Grinding stones	529	403	Taiwan 116; Japan 100.
Other	630	453	Japan 117; United States 67; Australia 65.
Asbestos:			
Crude, washed or ground	2,588	3,303	Canada 2,212; Portuguese Africa 754.
Manufactures of asbestos	2,987	1,829	United States 525; Japan 449; New Zealand 237.
Cement, hydraulic	24,317	15,712	Japan 11,838.
Clays and products:			
Crude	20,679	24,671	Japan 14,816; United States 6,373.
Products value, thousands	$2,396	$2,132	Japan $573; United States $478.
Diamond, industrial do	$64	$215	French West Africa $202.
Feldspar and fluorspar	1,881	2,270	Republic of Korea 1,058; Italy 750.
Fertilizer materials:			
Crude	113,398	155,216	United States 155,182.
Manufactured:			
Nitrogenous	110,234	122,656	Japan 103,981.
Phosphatic	14,468	2,361	Japan 1,000; West Germany 843.
Potassic	69,123	65,933	United States 26,359; Canada 18,305.
Mixed	1,237	1,692	West Germany 631.
Gypsum	42,481	11,434	Australia 8,128; West Germany 2,960.
Magnesite	1,093	1,785	Austria 1,365.
Pigments, iron oxides processed	110	251	United States 94; Japan 74; West Germany 66.
Salt	9,256	2,025	United Kingdom 1,425.
Stone, sand and gravel:			
Dimension worked	958	49	Italy 38.
Dolomite	5,819	3,739	Japan 3,099; United States 540.
Sand	4,814	3,907	Japan 3,732.
Gravel	87	231	All from Belgium.
Sulfur	11,834	5,767	Iran 5,077.
Talc	3,625	4,035	Republic of Korea 3,330; United States 457.
MINERAL FUELS AND RELATED MATERIALS			
Coal, coke and briquets	13,686	17,024	Japan 14,185.
Petroleum:			
Crude thousand 42-gallon barrels	60,589	66,408	Iran 17,432; Kuwait 16,614; Indonesia 15,140.
Refinery products:			
Gasoline:			
Aviation do	106	117	Bahrain 54; Iran 45.
Motor do	159	82	Malaysia 46; Singapore 36.
Kerosine and jet fuel do	19	45	Singapore 29; Indonesia 15.
Distillate fuel oil do	--	29	All from Malaysia.
Residual fuel oil do	32	--	
Lubricants including grease do	743	1,027	United States 501; Japan 220.
Other do	316	219	Sarawak 44; Indonesia 37; United States 37.
Total do	1,375	1,519	

NA Not available.

COMMODITY REVIEW

METALS

Aluminum.—Aluminum Resources Development Co. of Japan received a request from the Manila-based Conception financial group, headed by Republic Flour Mills, Inc., through Toyo Menka Kaisha to cooperate in developing bauxite deposits on Samar Island and establish an alumina plant there. The deposits were estimated at about 100 million tons containing 50 percent Al_2O_3 and 1 to 2 percent silica.

NPC's lack of funds to build transmission lines, and foreign equity participation in the proposed Aluminum Corp. of the Philippines exceeding the 30-percent limit, have been the major snags in building an aluminum smelter near Iligan City and the Maria Cristina Power Plant on Mindanao. Completion of the plant with an annual capacity of 30,000 tons was rescheduled for 1975 by the major participants: Republic Flour Mills, Reynolds Philippine Corp., and Hooven Aluminum Philippines. An estimated 18,000 tons would meet Philippine needs so that a surplus would be available for export.

Cadmium.—Benguet Exploration, Inc. produces about 10,000 pounds of cadmium annually as a byproduct in zinc and copper concentrates at its mill near Tuba, Mountain Province. The ore contains 0.01 percent cadmium.

Chromite.—Philippine chromite production, ranking fourth in the world, totaled 432,208 tons in 1971, a decrease of 24 percent compared with 1970. Exports decreased 33 percent below 1970 shipments. Refractory chromite production decreased 26 percent, and shipments dropped 32 percent. Metallurgical chromite production declined 13 percent, and shipments were down 36 percent. Although the unit price of refractory chromite increased an average of $0.66 per ton, the total value of exports decreased nearly 30 percent. The price of metallurgical chromite increased $5.17 per ton, however, the total value of exports dropped about 23 percent.

Refractory chromite ore reserves were 7.7 million tons at the Coto mine in Masinloc, Zambales, owned by Consolidated Mines, Inc., and operated by Benguet Consolidated. Acoje Mining Co.'s mine in Santa Cruz, Zambales, the country's only metallurgical chromite producer, has a reserve of 1.75 million tons of ore containing 22 percent Cr_2O_3.

Sinamar Mining Corp. reported 3.4 million tons of refractory and metallurgical grade ore reserves ranging from 30 to 55 percent Cr_2O_3 at its mines in San Felipe and San Narciso, Zambales.

Table 4.—Philippines: Production and exports of chromite

	1970		1971	
	Metric tons	Value, US dollars	Metric tons	Value, US dollars
Production:				
Refractory: Consolidated Mines, Inc	466,510	--	345,132	--
Metallurgical: Acoje Mining Co., Inc	99,933	--	87,076	--
Total	566,443	--	432,208	--
Exports:				
Refractory:				
Argentina	4,810	$106,841	4,500	$98,484
Australia	14,428	289,921	14,296	304,871
Brazil	14,024	265,069	9,423	184,244
Canada	14,225	282,181	6,890	137,541
Chile	--	--	6,103	122,726
Italy	10,445	221,933	19,033	394,239
Japan	46,221	945,235	34,307	692,314
Netherlands	4,583	91,136	5,118	105,200
Spain	--	--	630	12,854
Taiwan	--	--	295	6,300
United Kingdom	86,482	1,587,586	72,587	1,349,838
United States	234,211	4,380,960	115,329	2,257,154
Venezuela	8,520	174,002	4,935	110,032
Yugoslavia	--	--	4,650	99,213
Total	437,949	8,344,864	298,096	5,875,010
Metallurgical: Japan	98,975	2,555,525	63,238	1,959,697
Grand total	536,924	10,900,389	361,334	7,834,707

Copper.—The Philippines ranked eighth as a world producer of copper in 1971 when the country's output reached a record high of 197,573 tons of copper metal. Shipments comprising 743,765 tons of concentrate and 33,847 tons of direct shipping ore was exported to smelters, mostly in Japan, with some shipments to the United States and Europe.

Mine production by copper content for major producers is shown in table 5.

Table 5.—Philippines: Copper production by major producers

(Dry metric tons)

Company	1970			1971		
	Concentrate	Direct shipping ore	Copper content	Concentrate	Direct shipping ore	Copper content
Acoje Mining Co., Inc	--	7,505	712	--	6,244	594
Atlas Consolidated Mining & Development Corp	153,637	--	43,445	233,973	--	73,962
Benguet Consolidated, Inc.[1]	--	4,494	297	4,830	--	1,695
	--	--	--	--	--	[2] 138
Benguet Exploration, Inc	782	--	146	1,016	--	155
Black Mountain, Inc. (Kennon)	9,494	--	2,344	9,730	--	2,259
Consolidated Mines, Inc	23,826	--	4,984	15,153	--	2,876
Inco Mining Co. (Masara)	9,084	--	1,990	6,055	--	1,165
Itogon-Suyoc Mines, Inc	--	--	123	--	--	188
Lepanto Consolidated Mining Co	91,295	--	26,330	90,912	--	29,171
Marcopper Mining Corp	132,424	--	33,881	160,553	--	39,403
Marinduque Mining and Industrial Corp.						
Bagacay	56,637	31,466	9,468	49,847	27,603	7,519
Sipalay	92,845	8,255	19,778	84,491	--	19,058
Paracale-Gumas Consolidated Mining Co., Inc.[3]	--	--	1	--	--	--
Philex Mining Corp	68,746	--	16,797	85,817	--	18,969
Surigao Consolidated Mining Co., Inc.[4]	--	--	--	1,388	--	263
Other and unaccounted for	--	--	--	--	--	158
Total	638,770	51,720	160,296	743,765	33,847	197,573

[1] Started producing concentrates January 1971.

[2] From 342 dry metric tons of cement copper.

[3] Did not operate in 1971.

[4] Started producing concentrates February 1971.

The occurrence of copper is widespread in the islands, and reserves as reported by mining and exploration companies, exceed 1.5 billion tons of ore averaging 0.5 percent copper.

Atlas Consolidated with open pit and underground mines near Toledo, Cebu, increased production sharply during the year, and became one of the 10 largest copper mines in the world. The new $28.6 million Biga copper concentrator was inaugurated in July raising the milling capacity of Asia's largest copper producer by 86 percent, from 35,000 to 65,000 tons per day. Copper output derived from 21,306,315 tons of ore milled increased 69 percent over that of 1970 to 162,096,255 pounds. Leaching waste dumps added another 2,425,445 pounds of copper in the form of cement copper; leaching operations were suspended in November, however, as a result of curtailed ore purchases by Japanese smelters. Gold, silver, magnetite concentrate, and pyrite were also recovered. Following a sudden inrush of muddy ore on September 20, 1970, a disaster in which five men perished, production from certain higher grade but wet underground blocks was curtailed decreasing output from block caving operations. Increased production came from the Frank and the new Biga open pits. Atlas Consolidated ore reserves at yearend were 600 million tons containing an average of 0.5 percent copper.

Marcopper Mining Corp., operating the country's second largest open pit copper mine, near Santa Cruz, Marinduque, which started operation in late 1969, has repaid in full its $45.5 million loan from various foreign creditors. Nippon Mining Co. Ltd., buyer of Marcopper's copper concentrate, reduced importation of copper by 20 percent because of the economic recession in Japan and the curtailment of refinery operations on account of strict antipollution regulations in Japan. This prompted Marcopper to make a trial shipment of 3,500 tons of copper concentrates to a smelter in East Germany. Marcopper milled 6,693,074 tons of ore containing 0.79 percent copper in 1971 and produced concentrates containing 88,821,079 pounds of copper for an overall recovery of 84 percent. Mill throughput averaged 18,337 tons per day or an increase of 21 percent over 1970. Leaching oxide stockpiles recovered an additional 7,702,567 pounds of copper in cement copper. Minable ore reserves at yearend using a cutoff grade of 0.4 percent copper were 102 million tons of sulfide ore averaging 0.64 percent copper and 6 million tons of oxide ore averaging 0.53 percent copper.

Lepanto Consolidated Co., third largest copper producer, planned to install an arsenic removal plant to treat its copper concentrate because only two smelters in the world were willing to process high-arsenic concentrate, namely the Tacoma smelter in Washington and a smelter in Peru. Lepanto experienced difficulty in selling concentrates because of smelter and dock strikes on the U.S. west coast and pollution-control regulation curtailed smelter operations. The Tacoma smelter started to charge an additional fee to smelt Lepanto's concentrates. In 1971 Lepanto shipped 90,912 tons of copper concentrate to foreign smelters mostly to the United States and Japan but including a shipment of 14,000 tons to Europe in August. The company was in the process of sinking a new 22-foot diameter circular shaft to a depth of 2,200 feet in 1971, in order to develop additional ore reserves. Lepanto's ore reserves at Mankayan, Mountain Province, were increased to 9.2 million tons averaging 2.9 percent copper by additional drilling on lower levels.

MMIC operated large open pit copper mines at two locations; Sipalay, Negros Occidental, and Bagacay on Samar Island. Ore reserves were increased to 64.8 million tons averaging 0.8 percent copper at Sipalay. Ore reserves at Bagacay were 1.6 million tons of milling-grade ore averaging 2.7 percent copper and 221,000 tons of direct shipping ore averaging 10.6 percent copper. The company was accelerating stripping operations and expanding the output of the Sipalay mine to meet the needs of the new 14,500 tons per day capacity of the mill. MMIC has a contract with Mitsui Mining and Smelting Co. Ltd. and Nanyo Bussan Co., Ltd., of Japan to sell its entire production of copper concentrate within 10 years, starting in 1971. The Sipalay mine will furnish about 110,000 tons of copper concentrate annually, and the Bagacay mill, 54,000 tons of concentrate and 24,000 tons of copper ore.

Block caving from 10 active blocks at Philex Mining Corp's mine in Pacdal, Tuba, Mountain Province, supplied ore to the Banget and Santo Tomas mills. Total capacity of both mills was in excess of 18,000 tons of ore per day. Ore reserves were increased to 91 million tons averaging 0.51 percent copper. Philex Mining and Baguio Gold Mining Co. were also constructing a flotation plant at Tublay, Benguet, to treat copper ore from Santo Nino, Mountain Province. Initially designed for 3,300 tons of ore per day, this flotation plant can be quickly expanded to 4,500 tons if warranted. Known reserves were adequate for 12 years at 3,300 tons per day. Philex has agreed to pay $155,521 of its income taxes to the Province of Pangasinan for pollution damage to the Agno and Bued Rivers by its tailings. Philex completed a $933,000 structure for impounding its tailings. A bill was introduced in Congress to appropriate funds for the construction of a tailings pipeline to the China Sea costing $3.27 million.

Consolidated Mines, planned to increase milling capacity of its mine at Mogpog, Marinduque, from 1,000 to 1,500 tons per day. Consolidated Mines' ore reserves in the Isao-Pili area were 4.3 million tons averaging 1.3 percent copper and those in the Ino-Capayong Bintakay area were 61 million tons averaging 0.65 percent copper. Black Mountain, Inc., operated the Kennon mine at Tuba, Benguet Mountain Province, owned by Benguet Exploration, Inc. In addition to block caving, panel caving was used for some sections of the ore body. Ore reserves at the Kennon mine were increased by drilling to 24 million tons averaging 0.47 percent copper. Plans were made to increase Kennon's mill capacity from 2,400 to 5,000 tons of ore per day. Inco Mining Co. (Masara) was in the process of raising mill capacity from 1,500 to 2,000 tons per day at the Masara Copper Mine near Mabini Davao owned by Samar Mining Co. Inc. Reserves at this mine were increased to 12 million tons of ore averaging 0.5 percent copper. Benguet Consolidated continued to recover copper at Balabac Island, Palawan, through leaching but at a much slower rate. In January 1971, the company started milling 200 tons of copper ore per day from the Antamok Mine in Itogon, Mountain Province. Flotation capacity was increased to 600 tons per day with a corresponding decrease in gold ore milled. A further increase to 800 tons per day was expected by January 1972. Antamok ore reserves totaled 660,000 tons averaging 3.1 percent copper.

Acoje Mining Co. scheduled operation of its 500 tons per day mill at Barlo, Pangasinan, for July 1971. Acoje's reserves were estimated at 2.2 million tons of ore averaging 2.0 percent copper. Actual production of the Barlo mine during 1971 totaled 6,244 tons of shipping grade ore. In February 1971, Surigao Consolidated Mining Co. Inc. (Suricon) Lipawan mine near Dumingag, Zamboanga del Sur, was brought into production by the White Eagle Overseas Oil Co. Cement copper was produced from drainage water at Suricon's Guripan mine nearby in an interim period while the Guripan mill was being reconditioned and the capacity increased to 200 tons per day. Suricon was also planning to build a new mill at Lipawan with a daily capacity of 150 tons to process 1.5 percent copper ore from new deposits discovered by White Eagle, 70 kilometers west of Ozamis City and 10 kilometers from the old Suricon mill. White Eagle estimated ore reserves were 1.5 million tons averaging 1.5 percent copper. Itogon-Suyoc Mines, Inc. produced copper concentrate from the Suyoc mine near Mankayan, Mountain Province. Itogon also contracted with Western Mindoro Corp. to mine copper ore from its Boneng property near Atok, Benguet. Ore reserves at Boneng were 25 million tons averaging 0.42 percent copper.

Philippine Iron Mines Inc. (PIM) planned to increase flotation capacity for producing copper concentrate from scavenger tailings at its iron ore concentrator. Ore reserves of the Larap, Jose Pangañiban, Camarines Norte Province copper-molybdenum deposit were estimated to be 17 million tons. The company was selling 2,000 to 3,000 tons of concentrate containing about 20 percent copper to Philipp Brothers Oceanic, Inc.

Operation of Omico Mining and Industrial Corp.'s 100-ton per day mill at Macawiwili near Itogon, Benguet, was disrupted by a strike. As of August 1971 the company had a stockpile of 200 tons of copper concentrate. The company was acquiring equipment to increase milling capacity to 2,000 tons per day. Dizon Copper-Silver Mines Inc., in a joint venture with Nippon Mining Co. Ltd. of Japan, was building a 10,000-ton per day mill at Botolan, Zambales, with completion scheduled for late 1973. Ore reserves were 75 million tons averaging 0.50 percent copper.

Demmag Inc. (Philippines) was planning to install a leaching plant for its mine in the Inayawan district of southern Negros Occidental with equipment furnished by Nichimen Co. Ltd. of Japan. Santa Barbara Development Corp. reportedly started excavation for copper and iron ore in Olango, Espana near San Fernando, during 1971. Batong-Buhoy Gold Mines, Inc., was developing two copper deposits at Balatoc near Pasil, Kalinga-Apayao, with the help of Nippon Mining Co. of Japan. Although initial production was scheduled for only 6,000 tons of ore per day, the plan was to complete construction of a 15,000-ton-per-day mill by 1972. Combined ore reserves were reported to be 69 million tons.

Many other exploration projects have been initiated by the major mining companies and numerous newcomers to the mining industry. Copper prospects were being drilled from northern Luzon to southern Mindanao. Benguet Mining Co. was exploring the Ungay-Malobago deposit on Rapu Rapu Island, Albay. Copper Belt Mining Corp. was drilling its Balete deposit near Suyoc, Mountain Province, where reserves already amounted to 8.2 million tons averaging 0.45 percent copper. Jel Mining and Development Corp. was exloring a deposit near Minglanilla, Cebu. Jabpract Mining and Industrial Corp. (Jinico) was prospecting deposits near Patnongon, Antique and Gabaldon, Nueva Ecija. Lepanto Consolidated was exploring two porphyry copper deposits—one in Kalinga and the other in Surigao. Liberty Mines Inc. investigated copper deposits near Ilagan, Tumauini, and Cordon, all in Isabela Province. Sabena Mining Corp. drilled its Tagpura and Kalamatan deposits in Davao and calculated ore reserves of 9.0 million tons averaging 0.75 percent copper. Olasahar Mining Corp. was exploring a deposit on Leyte and seeking Japanese assistance. Pentagon Mines, Inc., was building a mill for its copper deposit at Digkila-an near Iligan City, Mindanao.

Pentagon was also exploring deposits in Camarines Norte and on Guimaras Island, Iloilo. Trident Mining Corp. reported that ore reserves at its Lonoy, Midway, and Bonot ore bodies near Sulatin in eastern Samar amounted to 5.9 million tons averaging 0.87 percent copper and 26 million tons averaging 0.4 percent copper. Benguet Consolidated was in the process of drilling two porphyry copper deposits: Tawitawi east of Baguio City with 22 million tons of 0.55 percent copper ore already delineated and Boy-otan in the Ampusungan district of Benguet. White Eagle Overseas Oil Co. was reexamining Hixbar Mining Co.'s copper mine on Rapu Rapu.

Nippon Mining, Japan curtailed purchases of copper concentrates 24 percent as a result of President Nixon's 10 percent surcharge on all imports entering the United States in August 1970 and Japanese pollution-control regulations. Copper mining firms with long-term sales agreements were Inco Mining Corp., Philex Mining Corp., and Marcopper Mining Corp.

Many Japanese smelters have imposed antipollution fees on Philippine exporters of copper concentrates and have temporarily reduced imports. This one factor is slowly beginning to convince Philippine copper producers to support a copper smelter in the Philippine Islands.

Davey Ashmore Pty. Ltd., an Australian consulting firm, was hired by the Board of Investments to make a feasibility study for establishment of a copper smelter with an annual capacity of 80,000 tons of blister copper. The smelter would produce 35,000 tons of copper to be refined for domestic use and 45,000 tons of unrefined copper for export and would produce 193,000 tons of byproduct sulfuric acid. Of the refinery capacity, 15,000 tons would be for the domestic market and 20,000 tons for export. The investment would be $50 million, including $15 million working capital. The consultants favored the Outokompu process to other processes because of its suitability to the varied types of Philippine ores. Three companies supporting the project have long-term contracts to furnish Japan with copper concentrates: Atlas Consolidated until 1985, Marcopper to 1978, and MMIC until 1980.

Atlas Consolidated proposed to build a solvent extraction and electrowinning plant as an alternate to the proposed copper smelter. The cost of the Atlas proposal was estimated at $4.3 million compared with the smelter cost of $50 million. The liquid ion exchange-electrowinning process yields a more valuable electrolytic grade copper than the smelter's blister copper. The Atlas project would supply the country's wire and cable manufacturers with 10,000 to 15,000 tons per year. Phelps Dodge Philippines is the largest domestic copper wire and cable manufacturer.

Industrial Copper Corp. plans to have Kobe Steel Works, Ltd. of Japan build a copper tubing plant in the Philippines to produce 1,600 tons of 3/8- to 2-inch diameter copper tubing a year.

Gold.—Philippine gold production from five primary mines and as a byproduct from copper production ranked seventh in the world. The total production increased to 637,048 ounces, the highest since 1941.

On August 5, 1971, legislation was enacted establishing new ceilings on gold subsidies for a period of 5 years. Firms whose annual production exceeds 100,000 ounces will receive a subsidy of $7.78 per ounce plus 65 percent of the difference between production costs and the official gold price of $35 per ounce. The subsidy plus the official price cannot exceed $48.21 per ounce nor can this combination exceed production costs by more than $4.67 per ounce. Firms whose annual production is less than 100,000 ounces will receive a subsidy of $9.33 per ounce plus 70 percent of the difference between production costs and the official gold price. The total amount these firms can receive is limited to $54.43 per ounce or production costs plus $6.22 per ounce. Eligibility requires 70 percent ownership by Philippine citizens and the entire gold production must be sold to the Central Bank at the prevailing market rate or the rate fixed by the Government. Also each gold producer receiving assistance must give a bonus equivalent to 10 percent of the subsidy to its employees whose salaries do not exceed $77.76 per month. Secondary gold production was excluded from subsidy benefits.

Benguet Consolidated, the country's largest primary gold producer, will refuse the subsidy and notify the Monetary Board and the Gold Mining Assistance Board of its intention to sell gold production on the free market during 1972. Benguet received approximately 50 percent of the total subsidies paid in 1971 under the program, which amounted to $35.77 per ounce of gold recovered at the mill. Benguet's production was 228,165 ounces in 1971.

In September 1971, Lepanto Consolidated started operating a new gold mill at the Agusan mine in Nueva Ecija owned by Manila Mining Co. The initial capacity was 200 tons per day to produce 3,000 ounces of gold per month. Lepanto also operated its 180-ton-per-day gold mill in Mountain Province, producing about 35 percent of the total gold recovered from the Lepanto mine. The remainder of the 160,909 ounces of Lepanto gold was recovered in copper concentrates. Itogon-Suyoc, recovered 41,781 ounces of gold at Itogon and 21,550 ounces of gold at Suyoc in 1971. Benguet Exploration (24,156 ounces), and Atok-Big Wedge Mining Co. (3,733 ounces) were also primary gold producers during the year, all with properties in Mountain Province.

Byproduct gold production from copper operations increased in 1971. Philex Mining recovered 76,504 ounces of gold in Mountain Province; Marcopper Mining produced 51,170 ounces of gold in Marinduque; and Atlas Consolidated recovered 42,536 ounces at Toledo, Cebu. MMIC also recovered byproduct gold at Sipalay (3,332 ounces) and Bagacay (3,677 ounces). Smaller quantities of gold were produced from copper ores mined by Black Mountain, Inc. (2,020 ounces) at Kennon, by Inco Mining (3,291 ounces) at Masara, by Consolidated Mines (3,428 ounces) at Mogpog, and by Acoje Mining at Barlo.

Iron Ore.—Iron ore and pellet shipments rose to a record high of 2,166,889 tons in 1971, an increase of 16 percent above 1970 shipments, because of increased production of magnetite concentrates from beach sands and magnetic separation treatment of copper flotation tailings. Output value of iron increased 14 percent to $19,295,887.

PIM, continued to be the largest producer of iron ore, from its open pit and underground mines in Larap, Jose Pangañiban, Camarines Norte Province. Pellet shipments declined to 688,307 tons but overall output value increased to $9,008,103. The company recovered byproduct copper concentrate by flotation from iron concentrator scavenger tailings. PIM ore reserves are 52 million tons averaging 25.8 percent magnetic iron at yearend. Zambales Base Metals, Inc., mined and shipped 100,549 tons of iron ore from the Sibuguey mine in Zamboanga del Sur owned by Samar Mining Co. Zambales Base Metals entered into an agreement with Pagadian Mineral and Commodity Development Corp. to explore and develop the latter's iron deposit in Zamboanga del Sur near the Sibuguey iron mine. This deposit was reported to contain 1 million tons of high-grade iron ore.

FILMAG Inc. (Philippines), the country's largest magnetite concentrate producer, processed beach sands along the coast at Narvacan, Ilocos Sur, and exported 714,096 tons of magnetite valued at $5,017,631. Ore reserves were 38 million tons. Inco Mining added more magentic separators to increase processing capacity from 1,000 to 1,500 tons per day at its Tolosa, Leyte beach sand operation. Inco shipped 354,980 tons of magnetite averaging 60.5 percent iron valued at $2,342,607 to the United States. Ore reserves are 20 million tons averaging 22 percent magnetic iron. Long Beach Mining Corp. also shipped 39,830 tons of magnetite concentrate to the United States.

Atlas Consolidated exported 72,890 tons of byproduct magnetite concentrate averaging 65 percent iron from copper flotation tailings at Toledo, Cebu. Philex Mining shipped 39,830 tons of magnetite concentrate produced from copper flotation tailings averaging 63.8 percent iron. By December 1971, the company doubled its magnetic separation facilities at Santo Tomas II, Mountain Province.

FILMAG and other companies made shipments to local cement plants. Exports were made to Japan with the exception of Inco Mining and Long Beach Mining.

Republic Resources and Development Corp. developed magnetite sand ore reserves of 7 million tons containing 59 percent iron and 6 to 10 percent titanium oxide near Silago, Hinunangan, and Hinundayan, Leyte.

Iron and Steel.—The present iron and steel industry of the Philippines consists of one hot-rolling mill, three cold-rolling mills, five steel pipe and tube manufacturers, several electric arc furnaces that melt scrap into billets for the bar and rod mills, and numerous iron and steel foundries.

Iligan Integrated Steel Mills Inc. (IISMI), the country's largest semi-integrated steelworks that includes a 65,000-ton-per-year hot-strip mill and a 400,000-ton-per-year cold-rolling mill, did not operate all of its facilities at Iligan, Mindanao, during 1971. Elizalde Iron and Steel Corp. (Elisco) at Taguig, Rizal, also operated at lower capacity because of poor market demand and lack of protection from low-priced Japanese imports. Consequently in Executive Order No. 336, President Marcos approved a post operative tariff protection for cold-rolled steel black sheets. The Board of Investments was considering government action to merge the two companies into a consortium and seek international financing for a 1.7-million-tons-per-year blast furnace.

Lead.—Paracale-Gumas Consolidated Mining Co. Inc., the country's only lead producer in 1970 did not operate in 1971.

Manganese.—Gregorio T. Lluch Mining Co.'s shipments of manganese from its Gabu Mine at Titay, Zamboanga del Sur, to Japan decreased sharply. R. B. Industrial Co. at Cabadaran, Agusan, and South Sea Export Co. in Zamboanga del Sur also reported minor production of manganese. Total output for the country was 5,133 tons.

Mercury.—Despite very low prices worldwide, Palawan Quicksilver Mines, Inc., produced a record high of 5,020 flasks (76 pounds) of mercury in 1971 at its plant in Tagburos, Palawan. About 10,000 to 16,000 tons of ore per month with a mill-head-grade of 274 pounds of mercury per ton were processed through 5 rotary kilns. Ore reserves were 1.1 million tons containing 3.1 million pounds of mercury. Liberty Mines, Inc., was exploring mercury and manganese deposits near Puerto Princesa, Palawan. New Frontier Mines, Inc., was exploring mercury and nickel deposits in Palawan.

Molybdenum.—MMIC recovered about 3.9 tons of molybdenum concentrate as byproduct from its copper operations at Sipalay, Negros Occidental. PIM reported 17 million tons of copper-molybdenum ore reserves at Larap, Camarines Norte.

Nickel.—Acoje Mining Co. operated its 400-ton-per-day beneficiation plant at Santa Cruz, Zambales, to produce nickel-cobalt concentrate containing about 15 percent nickel plus cobalt, 1.4 ounces per ton of platinum, and 2.8 ounces per ton of palladium. Acoje's dunite ore reserves are 950,000 tons averaging 0.7 percent nickel, and the ore body is adjacent to the company's chromite deposit.

Nickeliferous laterite resources in the Philippines are estimated to exceed 3 billion tons. About 500 million tons of laterite and saprolite, averaging 1.3 percent nickel, were under development in 1971.

MMIC was proceeding with development of its mine and construction of its refinery on Nonoc Island, Surigao del Norte, that will have the capacity to process 3.5 million dry metric tons of lateritic nickel ore per year, which will yield 68.4 million pounds of pure nickel, mixed sulfide concentrates containing 6.6 million pounds of nickel, and 3.3 million pounds of cobalt. Pilot plant demonstrations on 5,000 tons of MMIC ore by Sherritt Gordon Mines Ltd. in Canada indicated nickel recovery of 82.8 percent on mill feed averaging 1.33 percent nickel and 0.12 percent cobalt.

The U.S. Export-Import Bank extended a $54 million loan to MMIC as part of the financing of the $232.5 million nickel project. The Development Bank of the Philippines will subscribe to $20 million of the MMIC capital stock at about $12.44 per share. Kobe Steel Works Ltd. of Japan will supply plant equipment with a total value of $64 million. Commercial production was scheduled for July 1974.

MMIC will sell 55 million pounds of nickel powder and/or briquet output for 10 years to Philipp Brothers Oceanic Inc., a subsidiary of Engelhard Minerals & Chemicals Corp., Sumitomo Metal Mining Co. Ltd. and Nanyo Bussan of Japan will purchase 11.2 million pounds of nickel briquets, 5 million pounds of nickel, and 3 million pounds of cobalt for a period of 7 years.

A. Soriano y Cia. continued exploration and development of its two lateritic nickel deposits. The Pujada Peninsula deposit contains 167 million tons of ore averaging 1.29 percent nickel and 0.06 percent cobalt with high iron content. Ore reserves at Long Point in west central Palawan are 183 million tons averaging 1.4 percent nickel and 0.118 percent cobalt with lower iron content. Pilot plant tests were made on both properties. Infanta Mineral and Industrial Corp. signed a 5-year contract to supply 600,000 tons of nickel ore to Sumitomo Metal Mining Co. Ltd. of Japan with the first shipment scheduled for late 1972. Infanta's mine near Brooke's Point, Palawan, has ore reserves of more than 1 million tons averaging 2.24 percent combined nickel and cobalt using a cutoff grade of 1.8 percent. Universal Oil Products Co., in a joint venture with Rio Tuba Mining Co., reports ore reserves of 18 million tons of lateritic nickel averaging 1.7 percent nickel with a cutoff grade of 1.0 percent at Rio Tuba, Palawan. In a joint venture Lecar & Sons, Inc., and Nippon Mining, Japan plan to produce 5,000 tons per day of nickel-bearing laterites near the municipality of Brooke's Point, Palawan, about 170 kilometers south of Puerto Princesa, Palawan. All Palawan lateritic ore is very wet with an average of 25 percent moisture.

A new company was being formed by Benguet Consolidated Inc., MMIC, and Global Marine Co. to develop Benguet's nickel deposit at Masinloc, Zambales, near the Acoje property. Ore reserves are 37 million tons averaging 1.48 percent nickel.

Platinum and Palladium.—Acoje Mining produced nickel-cobalt concentrates containing 1.4 ounces of platinum and 2.8 ounces of palladium per ton of concentrate at its 400-ton-per-day mill in Santa Cruz, Zambales. Concentrates were shipped to Japan.

Silver.—Silver production reached a record high of 1,939,843 ounces in 1971. Lepanto Consolidated was the leading producer recovering 472,260 ounces of silver from both its gold and copper mills in Mountain Province. Atlas Conolidated recovered 258,296 ounces of silver from its copper concentrator at Toledo, Cebu; Marcopper Mining produced 212,658 ounces in Marinduque, and Philex Mining recovered 120,400 ounces from its copper mill in Mountain Province. MMIC at its Bagacay and Sipalay copper mills and Benguet Consolidated were also large silver producers. Itogon-Suyoc recovered 33,115 ounces of silver at Itogon and 23,509 ounces at Suyoc. Smaller quantities of silver were produced by Benguet Exploration (91,128 ounces), Black Mountain, Inc. (3,133 ounces) at Kennon, Consolidated Mines (33,477 ounces) at Mogpog, Inco Mining (7,300 ounces) at Masara, Acoje at Barlo, and Atok-Big Wedge (3,764 ounces) in Mountain Province.

Zinc.—Benguet Exploration, Inc., produced 3,875 tons of zinc in 1971 from its 120-ton-per-day mill at Camp 6, Kennon Rd. Tuba, Mountain Province. The zinc was exported to Japan. Zambales Base Metals was planning to install a 1,000-ton-per-day mill at Ayala, Zamboanga del Sur, to produce 31,500 tons of zinc, lead, and copper concentrates per year. Completion was scheduled for July 1973. Ore reserves are 4.9 million tons averaging 5.23 percent zinc.

NONMETALS

Asbestos.—Short fibre tremolite asbestos production in 1971 was 1,200 tons. Philippine Asbestos Mining and Development, Inc., operated its mine at Kiliog, Bukidnon, near the Misamis Oriental border.

Cement.—Seventeen cement plants were in operation by the end of 1971 with an annual capacity of 37.4 million barrels or 6.4 million metric tons. Although production increased 27 percent above the 1970 level with a total output of 18,276,448 barrels, capacity utilization was still only 49 percent. Nevertheless, cement led all nonmetallic minerals in total value and was second to copper in mineral production value.

In February 1971, Iligan Cement Corp. started operation of its new plant with an annual capacity of 2.25 million barrels at Iligan, Lanao. Production for the year was 0.55 million barrels. Apo Cement Co., the Philippines' oldest cement producer with a plant at Naga City, Cebu, resumed operations in November with an annual capacity of 600,000 barrels. In July 1971, Floro Cement Corp. started operation of its new cement plant with an annual capacity of 2.7 million barrels at Lugait, Misamis Oriental. An early mechanical failure limited production to 38,000 barrels for the year. Other cement plants operating, with 1971 production in million barrels shown in parenthesis, were Island Cement Corp. (2.5) at Atpolo, Rizal; Republic Cement Corp. (2.2) at Norzagaray, Bulacan; Fortune Cement Corp. (1.6) at Taysan, Batangas; Hi-Cement Corp. (1.5) at Norzagaray; Filipinas Cement Corp. (1.5) at Teresa, Rizal; Universal Cement Co., Inc. (1.4) at Danao, Cebu; Bacnotan Consolidated Industries, Inc. (1.6) at plants in Bacnotan, La Union, and Davao, Mindanao; Rizal Cement Co., Inc. (1.2) at

Binangonan, Rizal; Mindanao Portland Cement Corp (1.0) at Iligan, Lanao; Luzon Cement Corp. (0.6) at San Ildefonso, Bulacan; Pacific Cement Corp. (0.3) in Surigao del Norte; Northern Cement Corp. (2.2) at Sison, Pangasinan; and Philippine Portland Cement Co. at Guimaras Island, Iloilo. Two plants were reported under construction; Midland Cement Corp. (Quezon) at Tanay, Rizal, with 3 million barrels annual capacity and Continental Cement Corp. at Norzagaray, Bulacan, with 2.6 million barrels annual capacity.

Exports of cement exceeded $5 million in 1971 and therefore became subject to the 4-percent export tax set in the Stabilization Tax Act of 1970. About 14 percent of the Philippine cement production was exported. Hi-Cement Corp. exported 702,000 bags of cement to South Vietnam. Shipments of 30,000 tons of cement were won on a competitive bidding at $14 per ton, f.o.b. Manila. The Philippines exported 50,000 tons of cement to Saigon and 20,000 tons to Quinhon between April and June. Philippine cement exports to Indonesia may not continue unless prices are reduced from $19 per ton, the quality of the bags are improved and shipping delays are overcome. Philippine cement bag breakage was 10 to 20 percent compared with less than 1 percent for Japanese bags.

Clays.—Clay was produced in small quantities for tile, bricks, ceramics, and industrial uses in most of the large provinces. Exports of glazed tiles by Mariwasa Manufacturing Corp. to eight countries were expected to exceed 66 million pieces in 1971 valued at $1 million. Alcantara Enterprises Inc. plans to build a refractory brick factory at Iligan, Mindanao, with an annual capacity of 37,200 tons. A roofing tile plant was started in Tiwi, Albay, using red clay.

Feldspar.—Most of the feldspar production came from Pampanga, with smaller quantities produced in Bulacan, Ilocos Norte, Rizal, and Nueva Ecija.

Fertilizer Materials.—Atlas Consolidated produced 174,418 tons of pyrite flotation concentrate in 1971 averaging 46.5 percent sulfur that was sold to local fertilizer plants. Atlas Fertilizer Corp. operated a 240-ton-per-day sulfuric acid plant and a 480-ton-per-day ammonium sulfate plant at Sangi Beach near the copper mine in Cebu. The plant produced a complete line of mixed fertilizers and byproduct gypsum. MMIC produced about 62,000 tons of pyrite concentrate averaging 46.5 percent sulfur as byproduct from its Bagacay copper mill in Samar; the pyrite cinders were sold to Esso Standard Fertilizer & Chemical Co. Inc. Esso operated a 390,000-ton-per-year fertilizer plant next to its Bataan Refinery. Chemical Industries of the Philippines, Inc., was planning to establish a plant in Taguig, Rizal, with a production capacity of 15,000 tons of sodium tripolyphosphate and 16,500 tons of mixed fertilizers per year.

Gem Stones.—Small quantities of Philippine jade were sent to Bangkok, Thailand, for cutting and polishing in 1971. A black gem called tektite reported to be a variety of billitonite was exported.

Gypsum.—Output of crude gypsum, mined mainly in Batangas, declined. However, byproduct gypsum production from phosphoric acid and superphosphate fertilizer operations in Cebu and Bataan increased. Indigenous gypsum has not been adequate to meet the needs of the cement industry. In recent years, imports of gypsum were necessary.

Lime.—Quicklime was produced in Quezon, Benguet, and Lanao del Norte. Hydrated lime was also produced in Quezon and Lanao del Norte.

Perlite.—Trinity Lodge Mining Corp. started operation of its perlite ore processing plant in San Pedro, Laguna, in mid-1971. The company mined perlite near Legaspi, Albay.

Quartz.—Most of the quartz was produced as silica sand for glassmaking. Largest production came from Palawan, Rizal, and Bulacan. Smaller quantities were produced in the following provinces: Benguet, Surigao del Norte, Quezon, Lanao del Norte, Papanga, and Bohol. Mariposa Mining Co. was mining quartz and silica near Cajidiocan on Sibuyan Island, Romblon, and shipping the white rock called "bantilling" to Japan.

Salt.—Salt recovered from sea water evaporation in 22 provinces increased, however, destructive typhoons brought about significant price increases. The largest production of salt came from the following provinces: Bulacan, Occidental Mindora, Rizal, Pangasinan, and Cavite.

Sand and Gravel.—Despite curtailed construction activities, sand and gravel output increased. Although production was widespread, the largest production occurred in Rizal, Bulacan, Pangasinan, Cotabato, Bohol, Quezon, Iloilo, Leyte, and Papanga Provinces.

Stone.—Stone was produced in most of the larger provinces, mainly for manufacturing portland cement. Small quantities of limestone were produced for agricultural use. Most of the dolomite was mined in Cebu, with lesser tonnages produced in Palawan and Rizal. Unfinished marble was quarried in Bulacan, Tarlac, Davao del Norte and Bohol. Good finished marble was produced in Oriental Mindoro, Romblon, Bulacan, and Davao del Norte. Tuff production was reported in Rizal.

Sulfur.—When the price of sulfur dropped, Benguet Consolidated, suspended development of its sulfur deposits 25 miles northwest of Dumaguete, Negros Oriental. A small quantity of elemental sulfur was produced in Cagayan.

Other Nonmetals.—Diatomite was produced in Camarines Norte; talc was produced in Occidental Mindoro, Rizal, and Zambales; and phosphate rock was mined in Bohol and Cebu.

MINERAL FUELS

Coal and Coke.—International Metallurgical Corp. started making metallurgical coke briquets from low-grade, low-carbon coal from deposits in Cagraray and Batan Island in Albay. Coal deposits estimated at 27 million tons were expected to last 20 years at an average yearly output of 500,000 tons of coke. The Philippines consumes an estimated 780,000 tons a year of coke for its major industries.

Coal production of 40,024 tons, all from Cebu, has been very erratic and generally on the downtrend. The market has been confined to a few thermal powerplants and cement plants.

Petroleum.—Although 250 or more wells have been drilled since 1896, commercially exploitable oil has not been found in the Philippines. Findings of the 1969 United Nations survey have spurred offshore exploration near Palawan. A recent Japanese survey for the Philippine Government singled out the offshore area in the basin south of Mindoro and Lamon Bay near Batangas as being relatively attractive for prospecting. In 1971 the Government approved 395,000 hectares of land and offshore for exploration in the Cagayan-Sulu Island and Sulu Sea area. During 1971, 34 companies were engaged in petroleum exploration and more than 40 additional companies have applied for exploration concessions. However, only eight drilling projects were in progress.

In March 1971, Oriental Petroleum and Minerals Corp. started drilling offshore in the northwest Palawan area near Ulugan Bay. In June, Republic Resources and Development Corp. (Redeco) in a joint venture with Philippine Oil Development Corp. (Podco) reported an oil discovery in its third well at Alegria, Cebu, but the Bureau of Mines (Philippines) could not confirm it. In April, Pioneer Natural Resources Exploration Co. in a joint venture with China Petroleum Corp. of Taiwan began drilling in concessions owned by American Asiatic Co. in Bantayan Island off the northern coast of Cebu, and later started a well near Santa Fe, Cebu. In May, Hercules Minerals and Oils, Inc., in a joint venture with White Eagle Overseas Oil Co. started to drill White Eagle's concessions on the Bondoc Peninsula in Quezon Province. In February, Pacifica Inc., in a joint venture with Acoje Oil Co., began drilling a 3,000-foot well on Badian Island off the coast of Cebu. The company made two additional agreements: (1) with Société Nationale des Pétroles d'Acquitaine of France for offshore exploration in the Visayan Sea, and (2) with Beacon Corp. of Kansas for exploration of its concessions in Cotabato, which in turn was 15-percent owned by Imperial Resources Inc. Fil-Am Resources started its first exploration well on Maremco Mineral Corp.'s concession 5 kilometers north of Tacorong, Cotabato.

In May, Philippine Overseas Drilling and Oil Development Co. (Philodrill) started drilling at Tabuk, Kalinga-Apayao. Philodrill, along with Sabena Mining Corp.; Philex Mining Corp. and Baguio Gold Mining Co. entered into an agreement with Endeavor Oil Co., N.L. of Australia for exploration 40 miles offshore on the southwestern edge of the Sulu Sea. South Seas Oil and Mineral Exploration Development Co., Inc. and San Jose Oil Co. were drilling near General Santos, Cotabato. California Asiatic Oil Co. and Texaco Overseas Petroleum Co. were planning offshore exploration in the Palawan and Sulu Sea area. The Philippine Government accepted Gulf Oil Corp.'s offer to perform offshore seismic surveys starting in June and turn over the results at no cost. Mobil Oil Corp. made a similar offer, to start in late 1971.

Exports of refinery products totaled 1,096,177 tons, mainly to Japan, Singapore, Hong Kong, Brunei, and Borneo. Petroleum pitch and coke, gas oil, bunker fuel, and fuel oils were the principal oil products exported.

All crude petroleum has been imported. Imports in 1971 amounted to 8,868,943 tons, mostly from the following countries, with the quantity shown in million tons: Iran, 2.2; Kuwait, 2.1; Indonesia, 1.7; Sarawak, 1.5; and Saudi Arabia, 1.2. An additional 175,529 tons of refined petroleum products were imported.

Details of combined production from four refineries in the Philippines having a combined total crude distillation capacity of about 180,000 barrels per day is shown in table 1.

The British operated oil firm, Shell Philippines, Inc., was expanding production capacity of its refinery in Tabangao, Batangas, from 62,000 to 130,000 barrels per day. Bataan Refinery Corp. was continuing its expansion program to increase capacity of the refinery from 63,000 to 108,000 barrels per day.

Filoil Refinery Corp. was seeking approval by the Oil Industry Commission (OIC) for its plan to sell half of the 62.7 percent stockholding of Gulf Oil Corp. in the company to Filipino investors. Filoil made application with the OIC to expand its refinery capacity from the present 28,000 to 100,000 barrels per day. Shell Philippines, Inc., Esso Philippines, Inc., and Caltex Philippines, Inc. plan to oppose this expansion.

Caltex signed a long-term contract with Philippine Petroleum Corp. (PPC) for the supply of "feedstock," the crude oil raw-material for the manufacture of lubricating oil base stocks. PPC was constructing a lubricating oil refinery in Pililla, Rizal, to produce lubricating oil base stocks currently imported by the oil companies. The feedstock, a residue from the atmospheric distillation of medium Arabian crude, will be transported by Caltex tankers; unloaded at the Caltex refinery in Bauan, Batangas; piped to Sucat, Muntinglupa; then barged to Pililla. Imports of lubricating oil base stocks in 1970 totaled 764,000 barrels. Annual demand was growing at the rate of 9.7 percent.

The Mineral Industry of Poland

By Bernadette Michalski [1]

The mineral industry, supported by both domestic and imported raw materials, has been a significant factor in Polish economic development, contributing significantly to the nation's mineral consumption requirements and affording an avenue to foreign currency earnings through exports of coal, zinc, copper, and sulfur. In addition to exports of marketable minerals and mineral products, Poland has developed an export market for mineral-related technology with sales of mining and manufacturing equipment as well as complete industrial units.

In 1971 overall industrial production increased by 8 percent over that of 1970. Expanded mineral industry output was largely responsible for this increase as the minerals industry, which includes processing through semimanufacture, contributed about 30 percent of the value of industrial production.

PRODUCTION

The Polish statistical office reported significant increases in production of mined and electrolytic copper, crude steel, elemental sulfur, coal, and petroleum products. Expanded output resulted from industrial investment priorities extended to those areas where foreign exchange earnings (or in the case of petroleum products, foreign exchange savings) are most advantageous.

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[1] Foreign mineral specialist, Division of Fossil Fuels.

Table 1.—Poland: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1969	1970	1971 [p]
METALS			
Aluminum metal, primary	96,800	98,800	100,000
Cadmium metal, primary [e]	420	450	500
Copper:			
Mine output, metal content [e]	48,300	72,000	99,000
Metal:			
Smelter	50,000	65,000	89,000
Refined including secondary	54,700	72,200	92,700
Iron and steel:			
Iron ore and concentrate, gross weight thousand tons	2,822	2,554	2,078
Pig iron do	6,602	6,846	7,043
Ferroalloys:			
Blast furnace do	133	137	143
Electric furnace do	114	119	133
Steel, crude do	11,291	11,795	12,738
Steel semimanufactures:			
Rolled, excluding pipe do	7,655	8,136	8,722
Pipe do	662	723	847
Lead:			
Mine output, metal content	54,400	57,200	62,800
Metal, refined including secondary	50,700	54,500	60,200
Nickel, mine output, metal content [e]	1,500	2,000	1,800
Silver, mine output, metal content [e] thousand troy ounces	165	180	200
Zinc:			
Mine output, metal content	170,800	186,800	193,600
Metal, refined, including secondary	207,500	209,000	220,000
NONMETALS			
Barite [e]	50,000	50,000	55,000
Cement, hydraulic thousand tons	11,830	12,180	13,082
Clays, bentonite	NA	50,000	[e] 50,000
Feldspar [e]	29,000	30,000	30,000
Fertilizer materials:			
Crude phosphatic, phosphate rock [e]	100,000	100,000	100,000
Manufactured:			
Nitrogenous:			
Gross weight thousand tons	2,941	3,142	3,217
Nitrogen content do	988	1,080	1,081
Phosphatic:			
Gross weight do	2,688	3,142	3,016
P_2O_5 content do	534	599	706
Gypsum and anhydrite:			
Crude [e] do	810	850	850
Calcined do	210	265	271
Lime (quicklime and hydrated lime) do	2,228	2,388	2,506
Magnesite, crude [e]	45,000	50,000	50,000
Pyrite:			
Gross weight [e] thousand tons	225	225	200
Sulfur content [e] do	88	88	80
Salt:			
Rock do	1,166	1,225	1,222
Other do	1,651	1,679	1,740
Stone, limestone, crushed and broken do	7,469	NA	NA
Sulfur:			
Elemental:			
Frasch process do	1,321	[e] 1,600	[e] 1,630
Other native do	660	[e] 1,083	[e] 1,083
Total do	1,981	2,683	2,713
Sulfuric acid do	1,516	1,901	2,252
MINERAL FUELS AND RELATED MATERIALS			
Coal:			
Bituminous do	135,010	140,101	145,491
Lignite and brown do	[r] 30,865	32,766	34,517
Total do	165,875	172,867	180,008
Coke:			
Coke oven do	14,820	15,208	15,504
Gashouse do	1,348	1,336	1,329
Total do	16,168	16,544	16,833
Fuel briquets, all grades do	1,578	1,832	1,945
Gas:			
Manufactured:			
Town gas million cubic feet	33,584	28,615	29,149
Coke oven gas do	202,529	207,331	210,368
Natural, marketed do	138,503	183,014	190,098

See footnotes at end of table.

Table 1.—Poland: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity [1]	1969	1970	1971 [p]
MINERAL FUELS AND RELATED MATERIALS—Continued			
Natural gas liquids, natural gasoline thousand 42-gallon barrels	214	226	NA
Peat	22,000	24,700	15,200
Petroleum:			
Crude:			
As reported thousand tons	439	424	395
Converted thousand 42-gallon barrels	3,257	3,146	3,116
Refinery products:			
Gasoline do	12,742	13,804	15,827
Kerosine (presumably including jet fuel) do	953	1,155	550
Distillate fuel oil do	14,480	16,703	19,568
Residual fuel oil do	13,626	13,820	15,058
Lubricating oil do	1,260	2,121	2,380
Grease do	[r] 202	113	101
Paraffin do	[r] 118	126	126
Bitumen do	2,945	3,325	[e] 3,500
Total [2] do	[r] 46,326	50,667	57,110

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, antimony, cobalt, germanium, gold, a variety of crude nonmetallic construction materials, and carbon black are also produced in Poland, but information is inadequate to make reliable estimates of output levels. Poland may also produce alumina in small quantities, but details on such an operation, if it exists, are not available.

[2] Total of listed commodities only, excluding products not reported individually in official sources as well as refinery fuel and losses.

TRADE

Polish overall trade in 1971 was reported at $3,874 million[2] in exports and $4,036 million in imports. While no details of Poland's 1971 mineral trade were available at the time of this writing, Polish sources report that all fuel and power exports totaled $543 million or about 14 percent of total exports, while imports of that commodity group totaled $260 million or about 6.5 percent of total imports in 1971.

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[2] Where necessary, values have been converted from Polish zloty (ZL) to U.S. dollars at the official exchange rate of ZL1=US$0.25.

Table 2.—Poland: Exports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Cadmium, metal, all forms	278	222	U.S.S.R. 206; West Germany 10.
Chromium trioxide	546	501	United States 414; Brazil 26.
Copper, metal, unwrought and wire	2,983	18,012	West Germany 7,737; United Kingdom 4,940; Czechoslovakia 3,067.
Iron and steel:			
Iron ore and concentrate	2,000	2,000	NA.
Scrap	230,009	228,007	East Germany 63,093; Austria 56,495; Switzerland 28,879.
Pig iron, including cast iron	464,441	378,857	Japan 227,479; United Kingdom 50,753; Bulgaria 22,804.
Ferroalloys	2,313	1,439	Italy 1,399; United Kingdom 40.
Steel ingots	140,204	3,014	All to Italy.
Semimanufactures thousand tons	1,453	1,618	U.S.S.R. 388; Romania 140; Yugoslavia 110.
Lead, ore and concentrates	[r] 7,218	14,138	All to West Germany.
Zinc:			
Oxide	1,759	1,926	Romania 420; Norway 345; Sweden 331.
Metal including alloys, unwrought and semimanufactures	108,892	106,306	U.S.S.R. 45,203; Czechoslovakia 13,371; Italy 8,172.
Other:			
Nonferrous ores and concentrates, n.e.s	6,357	17	NA.
Metal, nonferrous, n.e.s.:			
Scrap	24,430	21,131	Austria 11,498; Sweden 8,053.
Semimanufactures	660	939	Czechoslovakia 866; East Germany 73.
NONMETALS			
Cement	57,931	56,682	Italy 23,488; West Germany 22,344.
Clays and products:			
Crude:			
Bentonite	985	905	All to East Germany.
Refractory	65,512	63,846	Hungary 20,532; Italy 18,926; Austria 6,897.
Products:			
Fire clay manufactures	10,324	14,507	Finland 2,386; Czechoslovakia 2,085; Hungary 1,952.
Silica manufactures	2,144	2,557	Sweden 1,069; Hungary 832.
Fertilizer materials:			
Manufactured:			
Nitrogenous thousand tons	324	454	Arab Republic of Egypt 129; East Germany 97; India 80.
Gypsum and plasters:			
Gypsum do	506	556	Sweden 204; Denmark 140; Norway 109.
Plasters do	20	31	Finland 22; Hungary 6.
Lime	[r] 131,845	142,811	Czechoslovakia 110,266; Netherlands 19,627; Hungary 10,275.
Magnesite manufactures	344	551	Albania 235; Pakistan 225; Bulgaria 70.
Salt excluding brine thousand tons	138	156	Czechoslovakia 35; Hungary 33; Sweden 31; Finland 31.
Stone:			
Granite	24,170	9,240	Netherlands 7,233; West Germany 419.
Marble	600	786	Netherlands 548; Hungary 150.
Pavement stones	22,330	26,328	West Germany 21,877; Belgium-Luxembourg 2,614.
Sulfur:			
Elemental [1] thousand tons	1,451	1,775	France 266; United Kingdom 186; Czechoslovakia 134; West Germany 82.
Sulfuric acid	14,986	126,123	West Germany 64,341; U.S.S.R. 20,517; Switzerland 14,221.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	130	--	
Coal and briquets:			
Anthracite and bituminous thousand tons	26,374	28,816	U.S.S.R. 7,073; Italy 2,807; Denmark 2,722; Finland 2,593.
Lignite and lignite briquets do	4,381	3,972	East Germany 3,928; Czechoslovakia 44.
Coke	[r] 2,324	2,284	East Germany 707; U.S.S.R. 674; Hungary 280.
Gas, manufactured coke oven million cubic feet	281	277	All to East Germany.
Natural gas, liquid	14,684	1,910	East Germany 1,639; Hungary 205.
Petroleum refinery products thousand tons	1,695	1,314	West Germany 353; Austria 310; Denmark 228.
Rare gases, argon	94	--	

[r] Revised. NA Not available.

[1] Source: Sulfur (London), No. 92, January–February, 1971, p. 14. Czechoslovakian figure derived from official Czechoslovakian trade returns.

Table 3.—Poland: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum:			
Bauxite and concentrate	96,544	118,081	Hungary 100,497; Guinea 17,584.
Oxide and hydroxide	195,986	213,012	Hungary 155,643; West Germany 4,921.
Powdered metal	590	687	Austria 475; United Kingdom 125.
Bismuth metal including alloys, unwrought	133	64	United Kingdom 33; France 25.
Chromium, ore and concentrate	162,461	141,493	U.S.S.R. 76,336; Albania 45,361; Cuba 17,727.
Copper:			
Ore and concentrate	14,657	--	
Metal, including alloys, unwrought and wire	26,278	21,900	United Kingdom 15,525; U.S.S.R. 3,772.
Iron and steel:			
Ore and concentrate..thousand tons	11,575	11,843	U.S.S.R. 9,913.
Scrap..do	95	203	All from U.S.S.R.
Pig iron including cast iron..do	1,221	1,512	U.S.S.R. 1,478.
Iron powder..do	4	6	Sweden 3; U.S.S.R. 2.
Ferroalloys..do	10	20	Bulgaria 7; U.S.S.R. 4; Norway 4.
Semimanufactures..do	1,321	1,467	U.S.S.R. 815; Czechoslovakia 266; East Germany 115.
Lead metal including alloys, unwrought	14,904	14,178	Yugoslavia 6,265; U.S.S.R. 3,901; United Kingdom 2,792.
Magnesium metal including alloys, all forms	692	701	U.S.S.R. 601; Norway 100.
Manganese:			
Ore and concentrate	393,842	389,388	U.S.S.R. 364,255; United Kingdom 23,382.
Oxides	3,841	4,621	Morocco 1,721; U.S.S.R. 1,679.
Mercury..76-pound flasks	664	685	Netherlands 264; United States 142.
Molybdenum, ore and concentrate	600	282	Canada 132; People's Republic of China 100.
Tin, metal including alloys, all forms..long tons	3,925	3,481	United Kingdom 2,399; Malaysia 1,048.
Titanium oxide	10,245	12,397	United Kingdom 5,440; Italy 4,070; Czechoslovakia 2,085.
Tungsten, ore and concentrate	2,920	3,351	United Kingdom 2,650; People's Republic of China 701.
Zinc, ore and concentrate	83,601	124,034	Ireland 29,587; Iran 19,051; United States 11,772; Czechoslovakia 11,446.
Other:			
Nonferrous ores and concentrates	6,013	6,303	United Kingdom 5,935; Cuba 228.
Nonferrous semimanufactures n.e.s	20,326	23,879	U.S.S.R. 10,404; Yugoslavia 3,519; Czechoslovakia 2,416.
NONMETALS			
Asbestos	57,055	64,385	U.S.S.R. 26,825; Canada 15,405; United Kingdom 11,317.
Barite	17,145	25,376	Belgium-Luxembourg 16,405; People's Republic of China 4,434.
Cement	640,496	311,456	U.S.S.R. 298,091; Austria 12.
Clays and products:			
Crude:			
Bentonite	5,409	7,425	Italy 3,931; Yugoslavia 3,462.
Fuller's earth	6,527	11,547	Czechoslovakia 5,946; Yugoslavia 4,160.
Kaolin (china clay)	91,071	113,503	Czechoslovakia 47,653; United Kingdom 26,214; U.S.S.R. 16,260.
Refractory clays and burnt slate	21,462	20,799	U.S.S.R. 9,494; East Germany 5,062; United Kingdom 4,882.
Products:			
Fire clay manufactures	2,830	1,453	West Germany 1,116; East Germany 167.
Silica manufactures	8,396	12,960	U.S.S.R. 12,030; West Germany 830.
Cryolite	3,598	2,041	U.S.S.R. 1,590; East Germany 220.
Diatomite	1,500	2,024	United States 937; Belgium-Luxembourg 861.
Feldspar	13,028	13,415	Norway 8,411; Finland 3,881; Canada 623.
Fertilizer materials:			
Crude:			
Phosphatic, apatite concentrate..thousand tons	596	662	U.S.S.R. 662.
Manufactured:			
Phosphatic..do	r 1,365	1,531	Morocco 971; Tunisia 406.
Potassic..do	1,897	2,215	East Germany 1,083; U.S.S.R. 965.
Fluorspar	27,518	23,130	East Germany 10,380; People's Republic of China 10,023.
Graphite, natural	10,661	11,620	Austria 6,494; U.S.S.R. 3,671; People's Republic of China 813.
Magnesite:			
Crude	136,819	206,163	North Korea 104,258; Czechoslovakia 76,794; Yugoslavia 22,683.
Bricks	23,627	17,213	Austria 6,918; Czechoslovakia 6,775; Yugoslavia 2,305.

See footnotes at end of table.

Table 3.—Poland: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
NONMETALS—Continued			
Mica	1,189	1,508	India 1,490.
Pyrite	18,259	39,441	All from U.S.S.R.
Stone, dimension, marble	1,396	4,064	Italy 1,337; U.S.S.R. 1,023; Albania 1,013.
Talc	23,220	21,116	North Korea 7,977; Austria 6,697; Czechoslovakia 2,634.
MINERAL FUELS AND RELATED MATERIALS			
Coal and briquets:			
Anthracite and bituminous coal thousand tons	1,113	1,130	U.S.S.R. 831; East Germany 293.
Lignite and lignite briquets do	301	310	East Germany.
Gas, hydrocarbon:			
Natural million cubic feet	35,096	35,399	All from U.S.S.R.
Manufactured do	126	143	All from East Germany.
Petroleum:			
Crude thousand tons	6,510	7,011	All from U.S.S.R.
Refinery products do	2,397	2,417	U.S.S.R. 1,572; Romania 298; Italy 160; Albania 96.

r Revised.

COMMODITY REVIEW

METALS

Aluminum.—Refineries at Skawina and Konin operated near capacity, yielding a record output of 100,000 tons of primary aluminum in 1971. By yearend construction on the Konin aluminum rolling mill was nearing completion. The mill is scheduled to enter production in 1972 at 40,000-ton annual capacity.

Copper.—Poland's largest electrolytic copper refinery, the 60,000-ton-capacity Legnitca plant was operated at capacity during the year supplying the bulk of Poland's electrolytic copper output. Poland's second major copper refining facility, the Glogow smelter and refinery, entered production by mid-1971, raising the nation's total refining capacity to over 100,000 tons.[3] Earlier reports indicated that Poland's second major copper refinery was onstream in 1970; however, as the Glogow smelter and refinery covers processing from ore enrichment to electrolysis, it is probable that several processing units were in operation in 1970, but that the electrolytic plan did not enter production until mid-1971. Initial capacity of the Glogow refinery is reported at 40,000 tons of electrolytic copper. By 1975, the close of the current 5-year plan, the Glogow refinery capacity will be doubled to 80,000 tons annually. A third major copper refinery of 40,000-ton annual capacity is scheduled for construction in 1974, bringing Poland's total copper refining capacity to more than 180,000 tons by 1975.

Iron and Steel.—Pig iron and crude steel production maintained a significant growth pattern, increasing outputs over those of 1970 by 3 percent and 8 percent, respectively. The installation of larger capacity furnaces, often replacing obsolete units, was the major factor in expanded output. During 1971 a 2- by 200-cubic-meter tandem furnace and a third oxygen converter were installed at the Lenin iron and steel plant at Nowa Huta. This plant is Poland's largest iron and steel complex, accounting for approximately 40 percent of the nation's crude steel output in 1971. Three additional electric arc furnaces were installed during the year at the Warsaw steel plant. Investments in the iron and steel industry are planned at $12.5 billion during the 1971–75 period. A large part of the investment allotment will be spent on construction of a new iron and steel complex at Zabkowice-Losien in Upper Silesia. Designed and constructed with Soviet assistance, the complex will include two blast furnaces of 3,200-cubic-meter capacity and 3 oxygen converters of 350-ton capacity. The plant is scheduled to enter into production by 1976 with 3.5-million-ton annual capacity for pig iron production, a 4.5-million-ton crude steel capacity, and a 4-million-ton capacity for semimanufacture steel products.

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[3] Current reports refer only to Legnitca and Glogow operations in lower Silesia; however, 10,000 to 12,000 tons of electrolytic copper have been produced at the Szopienice zinc plant in upper Silesia, and there has been no indication that this operation was phased out.

Total construction costs for the Zabkowice-Losien plant are estimated at $6.25 billion and equipment cost is estimated at an additional $3.75 billion. Additional furnace unit installations in Poland's existing iron and steel plants and construction of the Zabkowice-Losien plan will hopefully bring Poland's steel output to a proposed 22 million tons annually by 1980.

Lead and Zinc.—Ore production was estimated at 5 million tons in 1971. Domestic production is supplemented by imports of zinc ores and concentrates that were refined at the Szopienice and the Boleslaw electrolytic zinc plant, the Silesia Gob retort zinc plant, and at the Miasteczko Slaskie Imperial smelting plant. Electrolytic zinc constituted about one-half of Poland's total zinc production in 1971, or about 105,000 tons. Zinc metal exports were valued at an estimated $35 million in 1971. While self-sufficient in zinc metal production, domestic refineries satisfy only 80 percent of Poland's lead requirements. The remainder is covered by imports from Yugoslavia, the U.S.S.R., and North Korea.

NONMETALS

Cement.—Domestic consumption requirements for cement are anticipated to increase by a million tons per year during the current 5-year plan. Most of the domestic cement requirement will be covered by construction of additional cement plants. By 1975 at least five additional plants will be operative. Construction of the Kujawy cement plant in Bydgoszcz Province and the Nowiny II in Kielce Province was near completion by yearend. The Warta cement plant of 1-million-ton capacity is scheduled for operation by 1973. In 1974 a 1.7-million-ton-capacity cement plant will enter production in Malogoszcz in Kielce Province. A 1-million-ton-capacity cement plant is scheduled for production in 1975 in Strzelce Opolskie in Opole Province, bringing Poland's cement plants to a total of 27. By 1975 Poland anticipates cement production at 18 million tons; however, consumption requirements throughout the development period would necessitate the import of 500,000 to 1,000,000 tons per year.

Sulfur.—The bulk of Poland's native sulfur production was recovered by the Frasch process from the Grzybów mine in Kielce and the Jeziorko mine in Rzeszów. Remaining sulfur production is obtained from the Machow open pit operations which yielded an estimated 3.5 million tons of sulfur ore in 1971.

Most of the elemental sulfur, 2.1 million tons was exported in 1971. New storage and handling facilities at the port of Gdańsk were completed early in 1971 to facilitate exports of ground and liquid sulfur. In January the Norwegian tanker M. S. Norvest initiated a shuttle schedule between Gdańsk and Rotterdam on a 9-day basis. Exports to Western markets in 1971 were estimated at 1.5 million tons of sulfur.

MINERAL FUELS

Coal.—Bituminous coal production in 1971 totaled a record 145.5 million tons, exceeding the extraction plan by 1.3 million tons. Although mine development activity was well underway during the year and at least one new mine, the Borynia, was opened by December, production growth is largely attributable to increased labor productivity. Coal output per worker per day increased by 3.9 percent compared with the 1970 figure.

Mine development of the Rybnik basin continued. Development activities at the Zofiowka mine will increase daily output of coking coal from its present level of 2,500 tons per day to 12,000 tons per day by 1975. Development work on the Pniowek mine continued throughout 1971. The mine is scheduled to open by 1975 at 15,000-ton-per-day capacity.

Of the total bituminous coal production in 1971, about 60 percent was consumed by industrial and power units, 16 percent by households and the remaining 24 percent was exported.

Natural Gas.—Natural gas accounted for approximately 5 percent of energy consumption in 1971. Domestic production of more than 190 billion cubic feet is supplemented by imports from the Soviet Union totaling 40 billion cubic feet in 1971. Production by 1975 is expected to reach 425 billion cubic feet, supplemented by 70 billion cubic feet of natural gas imported from the U.S.S.R.

Petroleum.—Refinery throughput for 1971 was estimated at more than 60 million barrels. About 95 percent of the crude was imported from the U.S.S.R. via the Friendship pipeline. The remaining 5 percent was obtained from domestic production. In addition, Poland imported about 18 million barrels of petroleum products.

In an attempt to keep refinery output in line with the nation's growing demands for petroleum products, the Polish Government has announced plans for construction of two new refineries, each with an initial capacity of 60,000 barrels per day and final capacity of 120,000 barrels per day, and the expansion of its largest refinery, the Plock complex, to 240,000 barrels per day by 1980. New refinery construction will reportedly be undertaken near Gdańsk and in Silesia. Construction of both refineries will be under Soviet contract; however, throughput for at least one refinery will be supplied by oil from the Middle East. British Petroleum Ltd. entered into a contract to supply 60,000 barrels per day of Middle East crude to the Gdańsk refinery for a 10-year period beginning 1974–1975.

By close of 1971, the Plock petroleum complex capacity was expanded from 120,000 barrels per day to 180,000 barrels per day. In mid 1971, the Polish Government purchased a license from Universal Oil Products for a catalytic cracking process for production of high-octane gasoline at Plock. Initial application was made in 1970, but action was delayed pending improved economic relations between U.S. and Poland. Production at Poland's second largest refinery, the 12,000-barrel-per-day Cziechowice Refinery, was disrupted by a fire in June. The refinery operated at two-thirds capacity for 3 months until fire damaged facilities were restored.

The Mineral Industry of Portugal

By Frank L. Fisher [1]

The Portuguese mineral industry continued its general upward trend in production, consumption, and trade in 1971 as the country maintained its place among the nations of Europe. The emphasis in development of mineral resources was centered on offshore exploration with several foreign countries cooperating with the Government of Portugal in research and development of the mineral resources in this area. The Sines Peninsula, south of Lisbon was one of the focal points with planned development of a deepwater port, and construction of a petroleum refinery and a large petrochemical complex, all with a total estimated cost of $1.2 billion.[2] The refinery is scheduled to have an initial capacity of 6 million tons per year and its associated petrochemical plant at a capacity of 200,000 tons of ethylene per year. In 1971 there were ten companies directly associated with metals and minerals. Six of these companies were located in Lisbon.

The Junta de Energia Nuclear is studying nuclear-powered electric generation to meet its future energy needs. The first Portuguese nuclear power plant is scheduled for 1979.

The Portuguese Government published the long awaited Industrial Development Law that encourages foreign investment on a selective basis by using such criteria as technology, location, level of capital participation, and local resource utilization. The new law forms the basis for a comprehensive industrial policy and is intended to stimulate growth by removing licensing requirements for new firms in many fields, allowing tax holidays and other incentives for new businesses and providing financial support for selected projects. Another government initiative was the creation of an investment advisory service to provide foreign and domestic firms with information on industrial development opportunities.

PRODUCTION

Available data on output of mineral commodities in 1971 are given in table 1. In the metals sector, production gains were reported for copper, gold, tin, titanium, and zinc. Among the nonmetals, output of barite, cement, diatomite, gypsum, pyrite, sand and gravel, and stone increased, whereas clays, sulfur, and talc decreased. Petroleum refinery output increased over that of 1970.

Table 1.—Portugal: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971 p
METALS			
Antimony, mine output, metal content	r 1	--	--
Arsenic, white	247	190	186
Beryl concentrate, gross weight	29	14	15
Columbite–tantalite concentrates, gross weight	r 6	4	11

See footnotes at end of table

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[1] Physical scientist, Division of Ferrous Metals.

[2] Where necessary, values have been converted from Portugal Escudo (Esc) to U.S. dollars at the rate of PE's 28.75=US$1.00.

Table 1.—Portugal: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971 [p]
METALS—Continued			
Copper:			
Mine output, metal content:			
In cupreous pyrite	3,825	3,311	3,328
In other ore and concentrate	180	357	586
In precipitate	69	54	43
Total	4,074	3,722	3,957
Metal, refined, primary	3,690	4,006	4,500
Gold:			
Mine output, metal content ..... troy ounces	[r] 16,333	11,992	13,696
Metal ..... do	18,101	13,085	NA
Iron and steel:			
Iron ore and concentrate:			
Hematite and magnetite ..... thousand tons	107	72	51
Manganiferous ..... do	56	54	48
Total ..... do	163	126	99
Pig iron ..... do	[r] 336	308	261
Ferroalloys (all from electric furnaces):			
Ferromanganese	1,623	1,170	4,151
Ferrosilicon	8,714	5,932	
Ferrotungsten	374	307	273
Total	10,711	7,409	4,424
Steel, crude ..... thousand tons	389	371	340
Steel semimanufactures ..... do	324	356	349
Lead:			
Mine output, metal content	1,802	1,558	1,383
Metal, refined	1,129	572	1,200
Manganese ore and concentrate, gross weight	6,928	5,526	4,784
Molybdenum ore and concentrate, metal content	--	--	3
Silver:			
Mine output, metal content ..... troy ounces	[r] 384,426	279,808	262,510
Metal including secondary ..... do	319,096	260,035	NA
Tin:			
Mine output, metal content ..... long tons	489	428	546
Metal ..... do	501	386	476
Titanium (ilmenite concentrate), gross weight	206	238	890
Tungsten, mine output, metal content	1,331	1,475	1,344
Uranium oxide (U_3O_8) produced [e]	95	95	95
Zinc, mine output, metal content	1,091	1,606	2,046
NONMETALS			
Andalusite	--	190	181
Asbestos	203	202	127
Barite	108	1,080	1,150
Cement, hydraulic ..... thousand tons	[r] 2,035	2,347	2,458
Clays:			
Kaolin	44,830	53,023	44,950
Other	66,146	64,900	60,920
Diatomite	2,805	3,195	4,671
Feldspar	24,079	30,809	18,771
Fertilizer materials, manufactured:			
Nitrogenous, gross weight ..... thousand tons	[r] 570	588	NA
Phosphatic, gross weight ..... do	[r] 473	453	NA
Mixed and unspecified ..... do	[r] 198	211	NA
Total ..... do	[r] 1,241	1,252	NA
Gypsum and anhydrite ..... do	95	115	178
Lime (quick lime and hydrated lime) ..... do	199	211	[e] 220
Lithium minerals, lepidolite	NA	NA	750
Mica, all grades	[r] 1,667	1,935	[e] 2,000
Pyrite and pyrrhotite (including cupreous):			
Gross weight ..... thousand tons	531	476	559
Sulfur content ..... do	[r] 235	213	249
Salt:			
Rock ..... do	166	194	235
Marine ..... do	142	207	[e] 200
Sand and gravel:			
Gravel ..... do	48	94	96
Sand ..... do	964	1,401	2,560

See footnotes at end of table.

Table 1.—Portugal: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971 p
NONMETALS—Continued			
Stone:			
Calcareous:			
Dolomite thousand tons	3	8	23
Limestone, marl and calcite do	3,354	4,974	6,283
Marble do	202	233	229
Other:			
Basalt do	45	23	62
Diorite do	7	43	54
Gabbro do	17	19	19
Granite do	1,965	2,101	1,654
Graywacke do	120	29	2
Ophite do	23	23	39
Porphyry do	59	11	100
Quartz do	101	144	158
Quartzite do	190	283	116
Sandstone do	5	1	1
Schist do	10	82	69
Serpentine	160	165	300
Slate thousand tons	56	32	44
Syenite do	4	3	3
Sulfur, elemental including calcined	8,339	3,148	2,824
Talc	1,200	1,807	1,275
MINERAL FUELS AND RELATED MATERIALS			
Coal:			
Anthracite thousand tons	r 417	271	253
Lignite do	8	--	--
Fuel briquets, all grades do	r 4	--	--
Gas, manufactured million cubic feet	4,031	NA	NA
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	r 1,853	4,420	4,556
Jet fuel do	488	1,464	1,688
Kerosine do	1,604	1,550	1,248
Distillate fuel oil do	3,245	5,573	6,251
Residual fuel oil do	4,116	8,258	9,757
Lubricants do	--	84	553
Other do	r 2,463	2,744	3,525
Refinery fuel and losses do	1,735	3,377	1,959
Total do	15,504	27,470	29,537

e Estimate. p Preliminary. r Revised. NA Not available.

TRADE

Portugal and Japan concluded a new trade agreement in which the Japanese will give reduced tariff rates to Portuguese imports. The agreement on tariff rates is very selective and excludes gasoline, crude oil, and coal during its 10-year term. The major Portuguese imports from the United States were iron and steel, semimanufactures, and coke.

Total imports in 1971 were up 12 percent over those of 1970 and exports increased 9 percent resulting in an overall trade deficit for 1971 of $617 million compared with $499 million in 1970. Iron and steel products and petroleum products were among the largest categories of imports by value.

Table 2.—Portugal: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum metal, including alloys, all forms	r 306	141	Angola 67; Mozambique 44.
Arsenic trioxide, pentoxide and acids	126	140	Argentina 45; Greece 41; Spain 29.
Beryl ore and concentrate	59	14	All to United States.
Copper:			
Ore and concentrate	20	--	
Metal including alloys, all forms	1,553	1,571	Sweden 686; Italy 341; United States 156.

See foototes at end of table.

Table 2.—Portugal: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS—Continued			
Gold metal troy ounces	235	56	United States 49.
Iron and steel:			
Ore and concentrate, including roasted pyrite:			
Roasted pyrite	4,980	9,174	All to West Germany.
Other	56	1	All to Cape Verde.
Metal:			
Scrap	14,945	5,989	Italy 5,200; Netherlands 267.
Pig iron, ferroalloys, and similar materials	r 9,337	6,907	West Germany 2,956; United Kingdom 1,363; Turkey 836.
Steel, primary forms	r 15,859	9,519	Angola 9,176.
Semimanufactures:			
Bars, rods, angles, shapes, sections	15,375	7,038	Angola 3,319; Mozambique 751; Guinea 521.
Universals, plates, and sheets	r 2,740	6,156	United Kingdom 2,758; Angola 1,783; Guinea 869.
Rails and accessories	35	56	Angola 37.
Wire	13,375	3,232	Greece 1,190; Italy 751; Mozambique 599.
Tubes, pipes, and fittings	12,851	12,040	Angola 3,823; Mozambique 3,764; Spain 962.
Castings and forgings, rough	r 1,989	3,041	Sweden 969; United Kingdom 600.
Lead:			
Ore and concentrate	3,500	2,631	France 1,951; West Germany 680.
Oxides	89	73	Angola 26; Mozambique 24; Republic of South Africa 20.
Metal including alloys, all forms	368	323	Angola 195.
Magnesium metal, including alloys	9	10	All to United States.
Manganese ore and concentrate	9,260	3,000	All to Norway.
Nickel metal including alloys, all forms	41	49	Netherlands 31; United Kingdom 16.
Platinum-group metals and silver:			
Platinum metal, including alloys troy ounces	202,009	6,510	United Kingdom 3,503; West Germany 2,118; France 887.
Waste and sweepings[1] do	4,274,535	1,356,387	Belgium-Luxembourg 1,308,726; United Kingdom 47,661.
Silver, worked and partly worked do	1,590	317	Brazil 156; Angola 90; West Germany 47.
Tin metal including alloys, all forms long tons	r 125	127	Angola 41; Mozambique 33; Netherlands 15.
Tungsten ore and concentrate	1,718	1,857	United Kingdom 1,020; Netherlands 360; West Germany 245.
Zinc:			
Ore and concentrate	2,457	3,622	West Germany 2,287; France 1,310.
Oxide	123	114	Mozambique 56; Angola 55.
Metal including alloys, all forms	261	445	Italy 170; Turkey 141; Japan 43.
Other:			
Ore and concentrate, molybdenum, titanium, vanadium and zirconium	500	12	All to United States.
Ash and residues containing nonferrous metals	992	763	Belgium-Luxembourg 554.
NONMETALS			
Asbestos	74	180	United States 170.
Cement	37,944	61,966	Guinea 22,601; Cape Verde 15,548; Angola 5,470.
Chalk	98	72	Angola 59.
Clays and products (including all refractory brick):			
Crude, n.e.s.:			
Kaolin	907	1,325	Netherlands 1,120.
Other	2,795	2,044	Italy 1,231; Spain 546.
Products:			
Refractory (including nonclay brick)	2,959	4,639	Gibraltar 3,307; Angola 753; Indonesia 120.
Nonrefractory	17,886	17,673	Mozambique 5,774; United Kingdom 2,139; Spain 1,957.
Diamond:			
Gem, not set or strung value, thousands	$58,983	$45,438	All to United Kingdom.
Industrial do	$713	$1,373	Do.

See foototes at end of table

Table 2.—Portugal: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
NONMETALS—Continued			
Diatomite and other infusorial earths	238	120	Netherlands 60; Angola 29.
Feldspar, leucite, nepheline, etc	13,338	9,779	United Kingdom 4,167; Italy 3,089; West Germany 1,123.
Fertilizer materials, natural and manufactured:			
Nitrogenous	75,694	71,765	Spain 24,470; Mozambique 17,916.
Phosphatic	44,868	96,259	Brazil 53,961; Nigeria 15,748.
Potassic	928	1,814	Angola 1,054; São Tomé and Principe 512.
Other, including mixed	18,432	34,309	Angola 16,890; Mozambique 5,061.
Gypsum and plasters	239	238	Mozambique 108; Angola 62.
Lime	2,789	1,859	Mozambique 779; Spain 416; São Tomé and Principe 280.
Mica, crude, including splittings and waste	1,424	352	United Kingdom 317; West Germany 35.
Pigments, mineral:			
Natural crude	103	68	Angola 30; Guinea 24.
Iron oxides, processed	56	80	Mozambique 33; Guinea 18; Cape Verde 11.
Pyrite (gross weight)	250,690	228,499	Belgium-Luxembourg 184,334; Denmark 44,161; West Germany 4.
Salt	244	4,981	United Kingdom 4,250; Denmark 500.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Marble and other calcareous	111,186	115,826	Italy 56,178; West Germany 22,552; Belgium-Luxembourg 12,518.
Slate	7,918	5,635	West Germany 1,764; Belgium-Luxembourg 1,586; Denmark 1,083.
Granite and other	52,611	78,100	West Germany 44,459; Denmark 21,176; United Kingdom 4,342.
Worked:			
Slate	7,932	4,723	Belgium-Luxembourg 1,286; West Germany 840; France 821.
Paving and flagstone	115,562	101,318	West Germany 48,488; Sweden 20,584; Denmark 12,756.
Marble and other	20,845	19,634	United States 5,765; France 3,482; West Germany 2,605.
Gravel and crushed rock	2,607	3,789	Mozambique 1,899; Gibraltar 965; Greece 240.
Quartz and quartzite	65,009	114,245	Italy 45,872; Norway 42,521; France 8,375.
Sand, not metal bearing	17,882	22,918	Gibraltar 18,244; Italy 3,100; Spain 800.
Sodium compounds	714	2,095	Angola 1,183; Mozambique 422; Republic of South Africa 300.
Sulfur, elemental, all forms	780	260	Angola 237; Australia 10.
Talc and steatite	34	72	Angola 57; Mozambique 12.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	10	186	Cape Verde 170: Angola 10.
Coal and coke, including briquets	143	626	Angola 530; United Kingdom 13.
Petroleum refinery products:			
Bunker deliveries:			
Distillate fuel oil thousand 42-gallon barrels	32	41	Foreign Flag vessels and aircraft.
Residual fuel oil do	110	404	
Gasoline do	26	34	
Jet fuel do	205	525	
Lubricants do	5	9	
Gasoline (including natural) do	r 93	363	United Kingdom 104; Guinea 103; Netherlands 80.
Kerosine and jet fuel do	r 733	1,013	United Kingdom 543; Netherlands 231; Demark 212.
Distillate fuel oil do	r 100	654	Netherlands 282; Guinea 147; United Kingdom 126.
Residual fuel oil do	107	1,494	United Kingdom 653; Italy 421; Cape Verde 177.
Lubricants do	r 85	146	South Africa 55; Angola 27; Mozambique 27.
Liquefied petroleum gas do	11	13	Guinea 6.
Other do	8	5	Guinea 5.
Total do	1,515	4,701	

r Revised.

[1] Including silver.

Table 3.—Portugal: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum:			
Bauxite and concentrate	610	--	
Oxide and hydroxide	1,543	1,916	West Germany 958; France 626.
Metal including alloys:			
Scrap	35	59	United Kingdom 31; Canada 17.
Unwrought	802	1,619	United States 665; United Kingdom 460; Canada 292.
Semimanufactures	9,855	11,658	Austria 2,492; West Germany 1,639; Switzerland 1,350.
Chromium:			
Chromite	--	187	All from Republic of South Africa.
Oxide and hydroxide	120	119	West Germany 75; United Kingdom 29.
Copper metal including alloys:			
Scrap	684	873	Canada 113; Ireland 82; Portuguese Guinea 50; Singapore 50.
Unwrought:			
Blister	1,348	1,949	Zambia 1,798; Angola 150.
Refined, unalloyed	3,999	5,838	Canada 2,686; Belgium-Luxembourg 2,292.
Master alloys	38	86	United Kingdom 78.
Semimanufactures	8,087	8,297	United Kingdom 3,919; France 1,267; Italy 1,239.
Gold metal, unworked or partly worked thousand troy ounces	659	963	Belgium-Luxembourg 816; United States 135.
Iron and steel:			
Ore and concentrate, including roasted pyrite	148,375	194,691	Angola 158,173; Spain 33,661.
Metal:			
Scrap	5,101	9,553	NA.
Pig iron, ferroalloys, and similar materials	5,968	11,730	West Germany 2,530; Canada 2,152.
Steel, primary forms	[r] 9,166	115,507	Japan 55,261; United States 29,775; Belgium-Luxembourg 7,982.
Semimanufactures:			
Bars, rods, angles, shapes, sections	39,891	62,749	United Kingdom 13,100; France 12,160; West Germany 10,547.
Universals, plates and sheets:			
Heavy, medium, and light plates and sheets, uncoated	144,840	146,571	West Germany 43,283; Belgium-Luxembourg 32,992.
Tinned plates and sheets	62,472	41,352	United Kingdom 14,662; West Germany 9,672.
Other coated plates and sheets	22,487	13,171	Belgium-Luxembourg 7,553; United Kingdom 1,657.
Hoop and strip	35,516	26,317	Belgium-Luxembourg 14,442; France 2,627; United Kingdom 2,511.
Rails and accessories	8,437	4,772	Belgium-Luxembourg 1,279; West Germany 1,233; France 1,146.
Wire	9,291	13,930	United Kingdom 4,790; Belgium-Luxembourg 1,826; West Germany 1,585.
Tubes, pipes, and fittings	16,484	16,100	West Germany 7,679; France 2,277; United Kingdom 1,939.
Castings and forgings, rough	[r] 1,411	1,170	United Kingdom 694.
Lead:			
Oxides	28	11	All from United Kingdom.
Metal, including alloys:			
Scrap	69	79	Gibraltar 35; Guinea 25.
Unwrought and semimanufactures	9,064	9,530	Mexico 4,666; United Kingdom 2,980.
Magnesium metal including alloys, all forms	9	3	United States 1.
Manganese:			
Ore and concentrate	515	985	Brazil 779; Japan 80.
Oxides	84	80	United Kingdom 31; France 20; Belgium-Luxembourg 18.
Mercury 76-pound flasks	841	908	Spain 702; Mexico 148.
Molybdenum metal including alloys, all forms kilograms	2,600	600	West Germany 100; Netherlands 100; United Kingdom 100.
Nickel metal including alloys, all forms	390	382	United Kingdom 190; West Germany 108.
Platinum-group metals and silver, including alloys:			
Platinum group thousand troy ounces	3,051	4,970	United Kingdom 2,862; United States 809; France 770.
Silver do	669	886	United Kingdom 594; West Germany 256.

See footnote at end of table.

Table 3.—Portugal: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS—Continued			
Tin:			
Oxides, long tons	12	42	United Kingdom 32.
Metal including alloys, all forms, do	119	181	Italy 100; Finland 50.
Titanium:			
Rutile concentrate	116	432	Australia 406; United Kingdom 26.
Oxides	3,554	4,142	Finland 1,766; United Kingdom 1,037; West Germany 782.
Zinc:			
Oxides	233	264	West Germany 102; United Kingdom 56; Sweden 43.
Metals including alloys:			
Scrap	113	118	Canada 101; West Germany 10.
Unwrought	8,055	10,403	France 2,388; Canada 2,385; United Kingdom 1,307.
Semimanufactures	652	751	West Germany 523.
Other ores and concentrates:			
Of titanium (except rutile), vanadium and zirconium	380	699	Australia 632; United Kingdom 39; Spain 25.
Unspecified nonferrous	15	34	United Kingdom 33.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum	657	654	Italy 347; Netherlands 184; United States 70.
Dust and powder of precious and semiprecious stones (includes diamond), kilograms	8	27	United Kingdom 23.
Grinding and polishing wheels and stones	309	332	United Kingdom 99; West Germany 74.
Asbestos	3,473	6,509	Canada 3,727; Republic of South Africa 1,573.
Barite and witherite	299	241	West Germany 214.
Cement	1,754	8,911	Sweden 2,084; France 808.
Chalk	3,180	4,024	France 2,897; Belgium-Luxembourg 878.
Clays and products (including all refractory brick):			
Crude, n.e.s.:			
Bentonite	3,123	4,632	Italy 1,358; United States 1,295; West Germany 873.
Kaolin	3,596	4,505	United Kingdom 3,749; Spain 400.
Other	5,348	4,965	United Kingdom 2,784; Spain 935; France 589.
Products:			
Refractory (including nonclay bricks)	5,478	4,981	Spain 1,434; West Germany 1,006; Austria 659.
Nonrefractory	1,952	2,156	Spain 1,563.
Cryolite and chiolite	50	70	All from Denmark.
Diamond, except powder and dust:			
Gem, not set or strung, carats	2,664	3,825	Belgium-Luxembourg 2,914; Israel 395; United Kingdom 319.
Industrial, do	22	--	
Unspecified, thousand carats	1,776	2,546	All from Angola.
Diatomite and other infusorial earths	2,516	3,249	United States 1,292; Italy 662; Denmark 415.
Feldspar, leucite, nepheline etc	1,647	1,468	Spain 910; United Kingdom 296; West Germany 143.
Fertilizer materials:			
Crude:			
Nitrogenous	4,030	--	
Phosphatic	308,078	248,864	Morocco 245,699.
Manufactured:			
Nitrogenous	1,860	4,600	Netherlands 1,870; France 1,536; West Germany 746.
Phosphatic	[r] 13,476	13,334	Belgium-Luxembourg 10,744; France 2,000.
Potassic	32,625	35,129	Spain 35,083.
Other, including mixed	[r] 43,113	43,209	Belgium-Luxembourg 12,666; United Kingdom 10,508; West Germany 9,276.
Graphite, natural	145	163	Norway 51; West Germany 49.
Gypsum and plasters	21,448	22,550	Morocco 21,830.
Magnesite	442	646	Netherlands 311; Austria 226.
Mica, crude and worked	153	203	Norway 140; United Kingdom 44.
Pigments, mineral:			
Natural crude	80	32	France 17; Belgium-Luxembourg 6.
Iron oxides processed	1,698	1,465	West Germany 656; Spain 580.
Salt and brine	1,060	3,087	Angola 1,696; Cape Verde 1,350.

See footnotes at end of table.

Table 3.—Portugal: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
NONMETALS—Continued			
Stone, sand and gravel:			
Dimension stone, crude and worked	1,142	633	United Kingdom 611.
Dolomite, chiefly refractory grade	3,783	3,806	Italy 2,131; Spain 1,504.
Flint and crushed rock	926	787	Belgium-Luxembourg 670.
Quartz and quartzite	165	234	Spain 58; Sweden 50.
Sand excluding metal bearing	2,500	5,256	Belgium-Luxembourg 2,548; Netherlands 2,384; Spain 286.
Sulfur:			
Elemental, all forms	27,282	24,066	France 18,755; Finland 3,540; West Germany 1,771.
Sulfur dioxide	283	561	Spain 251; West Germany 172.
Sulfuric acid	46	47	Italy 15; Netherlands 13; West Germany 11.
Talc, steatite, soapstone, pyrophyllite	2,667	3,378	France 1,550; Finland 745; Italy 336.
Other nonmetals, crude, n.e.s	12,538	11,793	Cape Verde 11,204; West Germany 327.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	1,167	1,012	Spain 763; Netherlands 111; Belgium-Luxembourg 82.
Carbon black	6,247	7,306	Spain 4,726; West Germany 1,514; United States 294.
Coal, all grades including briquets thousand tons	341	481	Poland 252; Spain 126.
Coke and semicoke do	346	258	West Germany 104; United States 55; United Kingdom 23.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	16,672	27,148	Iraq 14,550; Bahrain 5,856; Saudi Arabia 4,798.
Refinery products:			
Gasoline do	r 2,348	399	Netherlands Antilles 163; Spain 130.
Kerosine and jet fuel do	r 232	289	Netherlands Antilles 186; Italy 56; Spain 30.
Distillate fuel oil do	r 2,931	2,046	Netherlands 548; Spain 476; Iran 401.
Residual fuel oil do	r 2,139	1,226	Netherlands 402; Mozambique 393; United Kingdom 143.
Lubricants do	r 423	492	United Kingdom 278; Netherlands 102.
Other do	r 457	514	Spain 199; Netherlands Antilles 86; Mozambique 44.
Total do	r 8,530	4,966	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	12,664	13,517	Netherlands 6,419; United Kingdom 1,688; Spain 1,559.

r Revised. NA Not available.

COMMODITY REVIEW

METALS

Copper.—The Canadian Mining Co., Sciminex, obtained an option to conduct a diamond drilling program on the Intermine copper property in southern Portugal. Intermine is a mineralized copper-bearing zone approximately 1,000 meters long, which has been worked periodically since ancient Roman times. Desseminated chalcopyrite was found through about 40 feet at a depth of approximately 350 feet in one conspicuous geochemical anomaly.[3]

Iron Ore.—The domestic iron ore industry supplied approximately 100,000 tons of ore in 1971, which averaged about 50 percent iron content. One pellet plant was operating during the year, and a second was in the planning stage. The operating plant, that of Minacorvo Ltda. at Torre de Moncorvo, has a capacity of 2 million metric tons of 65 percent iron pellets per year. Siderurgia Nacional Sarl at Seixal planned a pelletizing plant with initial capacity of 2 million metric tons per year, to be fully operational by 1975. Eventually capacity is to be increased to 5 million metric tons per year.

Tungsten and Tin.—Beralt Tin and Wolfram Ltd. continued its expansion program for production of tin and tungsten concentrates. Developed ore reserves are sufficient for a 3- to 4-year production at a rate of 1,800 to 2,200 tons of concentrate per year. The company reportedly experienced difficulties in maintaining an adequate labor force to support increased mechanization. Beralt also developed the Ribeira tin-tungsten mine for production of about 600 tons of concentrate per year.

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[3] Northern Miner. Sciminex Drilling Copper in Portugal. V. 57, No. 37. Dec. 2, 1971. p. 15.

Other Metals.—Minas de Terramonte Ltda. mined and milled 90,255 metric tons of ore, assaying 1.94 percent lead, 2.07 percent zinc, and 3.3 ounces of silver per ton.[4]

The Government granted the Portuguese company, Companhia União Fabril Sarl (CUF) with Sociedade Mineira de Santiago, a concession to prospect for pyrite in a zone that extends across the Lower Alentyo and the Iberian Peninsula into Spain. CUF made a preliminary estimate of 20 million tons of copper, lead, and zinc ore in the area and began studying the possibility of extracting the metals from pyrites in the form of mineral concentrates.

The planned Sines industrial complex will have metallurgical and chemical plants for treating 1 million tons per year of pyrite ore.

NONMETALS

Production of nonmetals showed a mixed trend in 1971. Barite, cement, diatomite, pyrite, and salt production showed gains in quantities produced. Lower production was recorded for asbestos, clays, feldspar, sulfur, and talc.

Cement.—Cía. Industrial do Cimento do Sul started construction of a cement plant in southern Portugal with an annual capacity of 300,000 tons. The company also contracted to build a cement plant at Loule near Faro with a daily capacity of 1,100 tons. Both plants are scheduled for completion in 1973.

MINERAL FUELS

Petroleum.—Petroleum is normally imported. Consumption is increasing at a rate in excess of 7 percent per year, which has been an important factor in accelerating a systematic search for probable oil and natural gas deposits on land and also on the Continental Shelf. The Portuguese Government has made claim to all water and mineral rights within 12 miles from shore. The Leixos petroleum refinery is planning to increase its capacity from 250,000 to 500,000 barrels per day.

Approximately one-third of the domestic market is supplied by Sociedade Anónima Concessionária da Refinação de Petróleos em Portugal (SACOR). This company is owned one-third by the Government and the remainder by foreign and domestic private interests. Production of coal, distillate fuel oil, and gasoline increased in production during the year. Production of kerosine decreased and residual fuel oil experienced an upward trend.

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[4] World Mining. V. 7, No. 7, June 25, 1971, p. 141.

The Mineral Industry of Romania

By Joseph B. Huvos [1]

In 1971 Romania's most important mineral products were crude oil, bauxite, aluminum, iron ore, iron and steel, cement, barite, pyrites and salt; of these only crude oil, with 0.58 percent of the world's total production, had any importance by world production standards. Some of the more important mineral industry facilities that were under construction or went onstream during the year were new mines for recovering complex nonferrous sulfide ores at Moldova Nouă, and Leşul Ursului; coal mines at Paroseni, Bărbăteni, Livizeni, and Lupoaia; and the open pit lignite mines at Betergea, Gîrla, and Tismana. In the iron and steel industry, the cold-rolling mill, at the iron and steel combine in Galati went onstream, new sections of the steel mills of Reşita, Galati, Hunedoara, and the steel pipe mill at Roman were also commissioned. Ammonia and urea capacities were opened at Turnu-Măgurele, as was the phosphoric acid fertilizer materials unit at Năvodari. Nitrogen fertilizer plants were opened at Slobozia and Piatra Neamt.[2]

In the electric energy producing industry, 978 megawatts of generating capacity went onstream, including the Iron Gates, Deva, and Palas-Constanta plants. Work continued on the Lotru hydroelectric power project and the thermal power plants at Rovinari and Brailă.

Romania's supply-demand balance for the more important minerals remained unchanged in 1971. In 1970, by world trade standards, only the export of about 5.3 million tons of petroleum products was significant.

Twenty-seven percent of Romania's total commodity trade was with the U.S.S.R.; trade with all East European countries (including the U.S.S.R.) amounted to 51.0 percent of total trade.

PRODUCTION

In 1971, production of all Romanian industries was valued at 334.2 billion lei.[3] This was a 12.6-percent increase over 1970 figures and corresponded to a 102.2-percent plan fulfillment.

During 1971, the main growth figures in the minerals and related industries were as follows:

Industry sector	Percent of growth
Electric and thermal energy	12.2
Fuels	3.7
Ferrous metallurgy, including mining	7.6
Nonferrous metallurgy, including mining	6.3
Chemical industry	15.2
Building materials	10.8

Significant increases were registered in the production of fertilizers, electric power, aluminum and its alloys, gasoline, alloyed and rolled steel, and natural gas.

In 1971, the minerals industry profited from the industry-wide high level of investment, which amounted to 42 billion lei and 516 million lei for completing unfinished 1970 projects.

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[1] Foreign mineral specialist, Division of Fossil Fuels.

[2] Scînteia, (Bucharest). Communicat . . . Indeplinirea planului . . . 1971. (Announcement . . . on results of the 1971 industrial production plan's fulfillment . . .). V. 41, No. 9046, Feb. 2, 1972, p. 1.

[3] Values have not been converted from Romanian currency units (Lei) to U.S. dollars, owing to the wide variation between the official exchange rate Lei 6=US$1.00 and those actually used for some transactions.

Table 1.—Romania: Production of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1969	1970	1971 [p]
METALS			
Aluminum:			
Bauxite	[e] 50,000	304,300	[e] 305,000
Alumina [e]	170,000	210,000	210,000
Ingot (including alloys)	89,650	101,283	[e] 110,100
Bismuth [e]	80	80	80
Cadmium [e]	60	80	80
Copper:			
Mine output, metal content, recoverable [e]	[r] 12,700	[r] 13,000	14,200
Smelter [e]	[r] 10,000	[r] 10,000	11,000
Gold [e] troy ounces	60,000	60,000	60,000
Iron and steel:			
Iron ore thousand tons	2,999	3,206	3,467
Pig iron and blast furnace ferroalloys do.	[r] 3,477	4,210	4,382
Electric furnace ferroalloys do.	8	1	--
Crude steel do.	5,540	6,517	6,803
Iron and steel semimanufactures:			
Castings and forgings, finished do.	494	524	NA
Pipes and tubes do.	756	767	825
Rolled products do.	3,816	4,504	4,763
Lead:			
Mine output, metal content, recoverable [e]	40,000	38,000	38,000
Smelter [e]	35,000	36,000	36,000
Manganese ore:			
Gross weight	127,000	[e] 127,000	[e] 127,000
Manganese content [e]	28,000	28,000	28,000
Silver, mine output, metal content thousand troy ounces	800	800	1,000
Zinc:			
Mine output, metal content, recoverable [e]	30,000	39,800	39,800
Smelter [e]	30,000	39,800	39,800
NONMETALS			
Barite [e]	100,000	116,500	116,000
Cement, hydraulic thousand tons	7,515	8,127	8,523
Clays:			
Bentonite	120,000	120,000	120,000
Kaolin [e]	50,000	50,000	50,000
Fertilizer materials, manufactured:			
Nitrogenous, nitrogen content	493,686	646,917	826,836
Phosphatic, phosphorus pentoxide content	221,418	244,176	244,664
Fluorspar [e]	15,000	15,000	15,000
Graphite	NA	6,019	--
Lime thousand tons	1,918	2,011	2,251
Pyrites:			
Gross weight do.	360	807	[e] 840
Sulfur content [e] do.	140	346	360
Salt do.	[r] 2,725	2,862	2,948
Sulfuric acid (monohydrate) do.	838	994	1,047
Talc	[e] 50,000	56,728	[e] 57,000
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	56,432	72,474	74,634
Coal:			
Run-of-mine:			
Anthracite and bituminous thousand tons	7,534	8,087	8,505
Brown do.	700	704	654
Lignite do.	10,918	14,044	13,792
Total do.	19,152	22,835	22,951
Washed (produced from above):			
For coke and semicoke production do.	1,176	1,306	1,329
Lignite do.	10,451	13,461	13,187
Other (unspecified) do.	5,349	5,764	6,085
Total do.	16,976	20,531	20,601
Coke, metallurgical do.	[r] 1,070	1,070	[e] 1,070
Gas:			
Manufactured million cubic feet	16,432	18,434	18,953
Natural:			
Associated do.	177,314	178,691	189,074
Nonassociated do.	665,750	705,266	754,494
Total do.	843,064	883,957	943,568
Petroleum:			
Crude:			
As reported thousand tons	13,246	13,377	13,793
Converted [e] thousand 42-gallon barrels	101,067	102,067	102,479

See footnotes at end of table

Table 1.—Romania: Production of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity [1]		1969	1970	1971 [p]
MINERAL FUELS AND RELATED MATERIALS—Continued				
Petroleum—(Continued)				
Refinery products:				
Gasoline	thousand 42-gallon barrels	22,268	23,681	25,645
Kerosine	do	7,777	7,510	2,866
Distillate fuel oil	do	34,265	37,666	39,366
Residual fuel oil	do	26,072	28,298	29,111
Lubricants	do	4,186	4,242	4,200
Asphalt	do	3,066	3,254	3,424
Petroleum coke	do	440	407	[e] 400
Liquefied petroleum gas	do	2,158	2,401	2,587
Total	do	100,232	107,459	112,599

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, antimony, asbestos, feldspar, gypsum, and mica as well as a variety of crude construction materials are produced, but information is inadequate to make reliable estimates of output levels.

TRADE

In 1970, the reference year for this chapter's trade tables, Romania's exports of all goods was valued at 11,104.9 million lei, with imports at 11,760.8 million lei. In 1971 exports increased by 13.5 percent to 12,600 million lei. In 1970, trade by major commodity groups was as follows:

	Million lei	*Percent of total*
Exports:		
Production equipment	2,510.7	22.6
Fuels, minerals and metals	2,536.7	22.8
Petroleum products	733.8	6.6
Chemicals, fertilizers and rubber	778.4	7.0
Building materials	785.4	7.1
Imports:		
Production equipment	4,655.1	39.6
Fuels, minerals and metals	3,662.5	31.1
Chemicals, fertilizers and rubber	788.3	6.7
Building materials	181.2	1.5

Romania did not publish trade figures by country showing major commodities traded, but only the total value of goods. In 1970, on the basis of total trade value, Romania's principal trading partners were as follows:

Country	*Percent of total trade*
U.S.S.R.	27.00
West Germany	8.58
Czechoslovakia	7.62
East Germany	5.80
Italy	5.39
France	4.54
United Kingdom	3.94
Poland	3.88

Trade with Communist countries was 11,654.1 million lei or 51.0 percent of Romania's total trade.

Table 2.—Romania: Exports of selected mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum and alloys:			
Scrap	3,072	2,307	West Germany 2,226; France 81.
Unwrought and semimanufactures	37,614	24,095	United Kingdom 8,528; Yugoslavia 4,472; West Germany 3,793.
Copper and alloys, unwrought and semimanufactures	2,986	3,086	All to West Germany.
Iron and steel:			
Scrap	252	--	
Pig iron and ferroalloys	88,972	5,373	Japan 5,003; France 200.
Steel:			
Primary forms [2]	[r] 44,800	181,900	Italy 37,600; West Germany 36,500; France 32,700; Lebanon 28,600.
Semimanufactures: [2] [3]			
Bars, rods, angles, shapes, sections	75,267	106,378	Poland 30,000; West Germany 29,475; Italy 19,686.
Plates and sheets	368,779	385,592	U.S.S.R. 217,400; West Germany 62,513; France 47,381.

See footnotes at end of table.

Table 2.—Romania: Exports of selected mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS—Continued			
Iron and steel—Continued			
Steel—Continued			
Semimanufactures—Continued			
Hoop and strip	16,114	11,037	All to Yugoslavia.
Wire	1,216	5,297	Israel 5,002; Italy 295.
Pipes, tubes, and fittings	189,884	237,552	U.S.S.R. 172,000; Poland 33,883; West Germany 17,192.
Castings and forgings	2,503	5,943	Poland 3,136; West Germany 2,807.
Total	653,763	751,799	
Lead:			
Oxides	--	388	All to Italy.
Metal and alloys, unwrought and semimanufactures	3,112	2,852	Italy 1,133; West Germany 877; Denmark 460.
Manganese ore [4]	48,100	28,900	Belgium-Luxembourg 8,455.
Platinum-group metals, all forms value, thousands	$540	--	
Silver:			
Waste and sweepings do	$1,044	$2,085	Italy $1,738; France $347.
Metal, crude and worked do	$2,374	$2,567	West Germany $1,599; France $968.
Zinc, metal and alloys, unwrought and semimanufactures	5,780	2,709	Switzerland 1,069; United Kingdom 795; Israel 263.
Other, nonferrous scrap, n.e.s	2,810	16	All to Italy.
NONMETALS			
Barite	29,700	42,900	All to U.S.S.R.
Cement [4] thousand tons	1,182	1,200	Yugoslavia 314; Spain 32.
Clays and products:			
Crude, bleaching	[r] 2,581	1,441	All to Poland.
Products, nonrefractory	1,399	24,836	All to Yugoslavia.
Fertilizer materials, manufactured:			
Nitrogenous	156,926	179,319	France 106,836; Spain 36,977; Greece 17,714.
Phosphatic	2,460	1,484	All to West Germany.
Mixed	--	15,916	Italy 9,483; Spain 5,891; Belgium-Luxembourg 542.
Pyrite, unroasted	48,335	40,816	All to West Germany.
Salt [4]	524,700	603,700	Yugoslavia 90,009; Greece 50,185.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	30,896	50,447	U.S.S.R. 49,300; Yugoslavia 1,147.
Soda ash	[r] 57,915	94,819	U.S.S.R. 76,000; Yugoslavia 15,951; Israel 2,868.
Stone, sand and gravel:			
Dimension stone, worked	12,839	21,700	All to West Germany.
Other	9,734	10,480	West Germany 8,831; Japan 1,188; Israel 461.
Talc	1,051	1,248	All to Poland.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt, natural	1,486	15,535	All to Yugoslavia.
Carbon black [4]	29,400	34,800	Italy 978; Israel 747.
Coal briquets	600	--	
Gas, natural and manufactures million cubic feet [4]	7,063	7,066	Mainly to Greece.
Peat and briquets	4,448	3,642	Austria 1,830; Italy 1,812.
Petroleum:			
Crude thousand 42-gallon barrels	--	13	All to Austria.
Refinery products:			
Gasoline do	7,247	5,956	West Germany 1,269; France 687.
Kerosine do	1,562	702	Yugoslavia 174.
Distillate fuel oil do	16,114	19,010	West Germany 3,600; France 2,518.
Residual fuel oil do	9,324	10,201	United States 2,751; Italy 1,203; Finland 928.
Lubricants do	2,658	2,444	Yugoslavia 78.
Mineral jelly and wax do	143	150	Italy 26; Finland 17; Yugoslavia 15.
Nonlubricating oil, n.e.s do	7	2	All to Yugoslavia.
Petroleum coke do	296	371	NA.
Total do	37,351	38,836	
Crude chemicals from coal, gas and oil distillation	14,999	11,889	West Germany 5,518; Yugoslavia 3,615; Israel 1,765.

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[r] Revised. NA Not available.

[1] Compiled from official export statistics of Romania and import statistics of selected trading partners.

[2] Includes data from World Trade in Steel, 1969 and 1970 editions, United Nations, New York; and 1969 and 1970 editions of Statistical Office of the United Nations. Supplement to the World Trade Annual, Walker and Company, New York, 1971 and 1972.

[3] Includes official trade data from Poland and U.S.S.R.

[4] From official Romanian export statistics.

Table 3.—Romania: Imports of selected mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum:			
Bauxite	165,213	158,863	All from Yugoslavia.
Alumina	4,032	21,517	Greece 19,285; West Germany 2,067.
Metal including alloys: Unwrought and semimanufactures	9,685	12,002	Italy 5,461; U.S.S.R. 3,813; West Germany 1,534.
Chromium, chromite	4,200	--	
Copper including alloys: Unwrought and semimanufactures	15,661	18,028	U.S.S.R. 5,923; West Germany 4,164; Italy 2,690.
Iron and steel:			
Iron ore [2] thousand tons	5,389	6,268	U.S.S.R. 4,245.
Pig iron, sponge iron, powder and shot do	518	500	Mainly from U.S.S.R.
Ferroalloys [2] do	90	102	U.S.S.R. 78.
Steel:			
Primary forms [3] do	322	263	U.S.S.R. 252; Japan 10.
Semimanufactures: [3]			
Bars, rods, angles, shapes, sections do	97	195	U.S.S.R. 112; Poland 47; Yugoslavia 9.
Plates and sheets do	467	477	U.S.S.R. 130; Japan 104; Poland 63; France 39.
Hoop and strip do	28	50	West Germany 16; Poland 12; United Kingdom 5.
Rails and accessories do	73	65	Yugoslavia 32; Poland 20; U.S.S.R. 13.
Wire do	r 16	15	West Germany 9; Belgium-Luxembourg 2.
Pipes, tubes and fittings do	67	82	West Germany 41; France 10; Italy 8; U.S.S.R. 7.
Total do	r 748	884	
Lead oxides	453	1,124	All from Austria.
Manganese oxides	626	731	All from Japan.
Mercury 76-pound flasks	2,814	638	Spain 493; Italy 58.
Nickel including alloys: Unwrought and semimanufactures	363	247	Sweden 92; France 79; West Germany 40.
Platinum-group metals: Unwrought and semimanufactures value, thousands	$816	$490	Italy $393; Austria $66.
Silver, unwrought and semimanufactures do	$139	$189	France $140; United Kingdom $31.
Tin, including alloys, unwrought and semimanufactures long tons	1,201	904	United Kingdom 892.
Titanium oxides	1,142	2,954	Italy 2,023; United Kingdom 374; France 322.
Tungsten metal, all forms	3	5	All from France.
Zinc:			
Power (blue dust)	940	1,181	Italy 923; Belgium-Luxembourg 190.
Oxides	776	535	Poland 420; United Kingdom 115.
Metal, including alloys, all forms	1,367	1,288	All from Bulgaria.
NONMETALS			
Asbestos	14,571	19,287	U.S.S.R. 16,300; Canada 2,987.
Barite and witherite	2,380	256	All from United States.
Borates, natural, crude	3,500	--	
Chalk	--	656	All from United Kingdom.
Clays and products:			
Crude n.e.s	9,384	19,586	Greece 10,594; United Kingdom 8,099.
Products:			
Refractory	45,532	27,552	Yugoslavia 13,934; Austria 4,680.
Nonrefractory	196	174	All from Italy.
Cryolite	500	535	All from U.S.S.R.
Diamond:			
Gem value, thousands	--	$71	All from United Kingdom.
Industrial do	$48	$158	Belgium-Luxembourg $111; France $35.
Feldspar and fluorspar	3,067	694	All from Italy.
Fertilizer materials:			
Nitrogenous, nitrogen content [2]	3,900	700	NA.
Phosphatic: Apatite concentrate, P_2O_5 content [2] [4]	308,700	317,000	Mainly from U.S.S.R.
Potassic, K_2O equivalent [2]	33,700	29,900	NA.
Graphite	96	--	
Magnesite	--	3,284	All from Yugoslavia.
Mica, worked	14	19	Switzerland 9; Austria 6.
Pigments, mineral: Iron oxide	337	663	West Germany 524; United Kingdom 139.
Stone:			
Dolomite	552	--	
Quartz and quartzite	831	435	All from West Germany.

See footnotes at end of table.

Table 3.—Romania: Imports of selected mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
NONMETALS—Continued			
Sulfur, elemental (including colloidal)	10,849	11,355	U.S.S.R. 6,003; Greece 3,810; West Germany 1,542.
Sulfuric acid	67,510	40,189	U.S.S.R. 30,200; Bulgaria 9,989.
Talc	359	--	
Other crude nonmetals	--	875	Netherlands 585; Japan 290.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	220	307	All from France.
Coal thousand tons	633	728	U.S.S.R. 400.
Coke do	[r] 2,307	1,822	U.S.S.R. 841; United States 353; Poland 201; Italy 121.
Petroleum refinery products:			
Lubricants do	9	5	West Germany 3.
Other products do	29	81	West Germany 45; Yugoslavia 22; United States 14.
Unspecified, possibly including crude oil do	21	15	All from Poland.
Crude chemicals from coal, gas, or oil distillation	189	182	All from West Germany.

[r] Revised. NA Not available.

[1] Compiled from official import statistics of Romania and from export statistics of selected trading partners.

[2] Data from official Romanian import statistics.

[3] Data from statistics of World Trade in Steel, 1969 and 1970 editions, United Nations, New York; and the 1969 and 1970 editions of: Statistical office of the United Nations, Supplement to the World Trade Annual, Walker and Company, New York, 1971 and 1972.

[4] Not reported in Soviet export statistics on a comparable basis.

Sources: Official trade returns of Bulgaria, Poland, Romania and U.S.S.R., and as indicated in footnote 3.

COMMODITY REVIEW

METALS

Aluminum.—In 1971, Romanian primary aluminum and aluminum alloy production reached 110,100 metric tons, 8.7 percent greater than in 1970, and exceeded the 1971 production plan by 2.6 percent.

In 1971, Romania imported 40,000 tons of bauxite, a fraction of all bauxite imported from Senj, on the Dalmatian peninsula in Yugoslavia.

A new bauxite mine was undergoing development near Arad, in the eastern part of Romania; production is to start in 1972 with a capacity of 100,000 metric tons of bauxite per year.[4]

Work continued at Tulcea, near the Danube delta, on a second alumina plant, which will have a capacity of 250,000 metric tons per year. The plant, the second largest in Romania, is expected to start operating in 1973.

By 1975, capacity of the Slatina aluminum smelter, the only one in Romania, is scheduled to reach 200,000 metric tons per year according to the 1971–75 5-year plan.

Copper.—In 1971 smelter copper production increased an estimated 1,000 tons, in accordance with current 5-year plan goals, which require an increase in smelter copper output of 36 percent by 1975, compared with 1970 figures. This would correspond to a 60 percent increased goal for copper ore mined, also by 1975, the end of the fourth 5-year plan.[5]

Romania, an importer of copper, continued its efforts for undertaking joint enterprises with countries having rich copper deposits. Romania signed a mineral exploration agreement with the Industrial Development and Renovation Organization of Tehran, Iran for metals exploration, in particular copper in the southeastern part of that country.[6]

A Romanian mission for geological prospecting was sent to the Central African Republic at the beginning of 1971. Cooperation between Romania and the Central African Republic will extend to the processing of any copper and uranium minerals found by the mission when prospecting in the country.[7]

Reports were confirmed about a Romanian-Chilean agreement for construction of a 75,000-ton-per-year copper smelter near Antofagasta, Chile, and two 40,000-ton-per-year refineries, one in each country. The refineries will process blister from the smelter (for more details see the Romania Chapter in the 1970 Minerals Yearbook, v. III). This joint enterprise would satisfy Romania's demand for copper and leave some for export.

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[4] Bányászati ás Kohászati Lapok-Bányászat Uj román bauxitelelöhely (new Romanian bauxite deposit) (Budapest). V. 105, No. 1, 1972, p. 71.

[5] Scînteia (Bucharest). prof. dr. ing. B. Almasan, Minister of Mining and Geology: In toate ramurile . . . (in all the branches of . . .). V. 40, No. 8666, Jan. 14, 1971, col. 1, p. 1.

[6] American Metal Market. Iran, Romania Sign Copper Hunt Pact. V. 78, No. 166, Aug. 27, 1971, p. 10.

[7] Centrafric-Press, Bangui. May 3, 1971, p. 1.

Iron and Steel.—During the 1971–75 5-year plan, iron ore mining will be continued at the existing mines in Teliuc, Chelar, Capuş, Lueta, and Ocna de Fier; production would remain roughly at the 1971 levels.[8] Iron ore imports will have to increase because iron and steel production will almost double by 1975. During 1971, iron ore was imported mainly from the U.S.S.R., India, and Algeria. Vigorous development of the steel industry as a whole continued in 1971, with steel production exceeding the current 1971 production plan by 1.2 percent. In the coming years, Romania's steel production plan targets are as follows:

Year	Planned production (thousand metric tons)
1972	7,340
1973	7,700–7,825
1974	8,100–8,320
1975	9,400–9,700

In 1971 the integrated iron and steel works at Galati, construction of which started in 1961, reached completion of its first planned construction stage, with the commissioning of plants with an annual capacity of 2.5 million tons of steel ingot; cold- and hot-rolled strip mills, were also commissioned. The second stage of the Galati construction plans will raise steel ingot capacity to 6 million tons. The plant specializes mainly in flat products and hot- and cold-rolled strip. The principal installations consist of two Dwight-Lloyd sintering strands with a 156-square-meter surface; two blast furnaces with a volume of 1,700 cubic meters each; three 150-ton basic oxygen-type converters; a slabbing mill with a 1,500-millimeter by 2,150-millimeter size rolls; the 1,050-millimeter plate-rolling mill with a vertical stand with side rolls; a four-high reversing rougher, 1,050/1,700 by 3,300 millimeters, and a reversing finisher, 920/1,700 by 3,300 millimeters. Ten thousand persons are employed.

New developments under the present 5-year plan will include the following: Three more blast furnaces of the type now in use, two further basic oxygen converters, a continuous casting plant, and an electric steel smelting shop with a capacity of 200,000 tons per year. The iron ore required for sintering in 1970 was supplied by the following sources:

Country	Share of total (percent)
Domestic (Capuç) ore	10
U.S.S.R	30
India	35
Algeria	25

Coke came mainly from the U.S.S.R., the United States, Poland, and Belgium.

The Hunedoara integrated iron and steel works operates a full steel production cycle comprising ore preparation (sintering), coke-oven batteries and gas processing plants, blast furnaces, steel smelters, and rolling mills. The labor force totals 18,500 persons. The equipment consists of the following: A sintering plant with a 3-million-ton-per-year capacity, consisting of two 50-square-meter and two 100-square-meter Dwight-Lloyd strands; a 1-million-ton-capacity coke-oven byproduct department, consisting of four coke-oven batteries with 47 ovens of 18.35 cubic meters each; gas purification, benzine rectification, and tar distillation plants; a 1.8-million-ton-per-year-capacity blast furnace department, consisting of two 1,000-cubic-meter, one 700-cubic-meter, and one 450-cubic-meter furnace; a 3-million ton-per-year-capacity steel smelting department, consisting of eight 400-ton-per-charge and five 60-ton-per-charge open-hearth furnaces, two 20-ton and two 50-ton-capacity arc furnaces, a rolling department, consisting of one 1,300-millimeter, 3-million-ton-per-year-capacity blooming mill and one 1,000-millimeter, 1.8 million-ton-per-year-capacity blooming mill. Two reversing mills and four continuous lines account for an output of almost 3 million tons per year.

Development prospects for the current 1971–75 5-year plan include expansion in the pig iron, steel, and rolling sections with a new 120-square-meter sintering strand for 3.7-million-tons per year of sinter and a new 1,000-cubic meter blast furnace which will raise total plant capacity to about 2.4 million tons of pig iron. In addition, steel output will be increased to about 3.4 million tons by oxygen injection in the existing 400-ton open-hearth furnaces; and construction of a 600,000-ton-per-year mild steel wire mill is planned.

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[8] Probleme Economice. No. 6, 1971.

Lead and Zinc.—The major nonferrous ore mines will be expanded during the current 5-year plan, to meet increased output goals. This involves mining some reserves of decreasing metal content at a higher cost. Nonferrous ore mining (lead, zinc, copper) will rise by 18.3 percent compared with 1970.[9]

NONMETALS

Cement.—Cement production in 1971 reached the goals of the production plan for the year, corresponding to a 4.9 percent increase over 1970 production. This made possible exports exceeding 1 million tons. The 1971–75 5-year plan prescribes the following production targets: [10]

Year	Output (million metric tons)
1972	9.7
1973	11.0–11.6
1974	13.0–14.0
1975	15.0–16.5

At yearend, it was reported that construction was started at Hoghiz, northwest of Braşov, on what will be the country's largest building materials combine, which will include a 2.4-million-ton-per-year capacity cement plant.

Construction started also near Cîmpulung-Muscel, in the Argeşul Valley near Bucharest, on a building materials complex, which will include a 2-million-ton-per-year capacity cement plant due to be commissioned in 1972.[11]

The Brodomaterijal Co. of Rijeka in Yugoslavia is going to supply $4 million worth of equipment for a cement plant at an unspecified location in Romania.

Fertilizer Materials.—In terms of total active substances (nitrogen, phosphorus pentoxide, and possibly including imported potassium materials), 1971 fertilizer production fell short of the planned target of 1,257,000 metric tons by about 14 percent, but output did exceed that of 1970 by 20.4 percent. Output targets for the 1971–75, 5-year plan are as follows:

Year	Thousand metric tons active substance
1972	1,463.7
1973	1,650–1,780
1974	2,100–2,260
1975	2,600–2,760

Although this year's production plans were not fulfilled, it was officially stated that prospects for the fulfillment of the ambitious 1972 and 1973 production plans will be met. In particular, the commissioning in 1971 of the Năvodari and Valea Călugărească plants will double the Romanian phosphate fertilizer production of 1970. Commissioning of the nitrogenous fertilizer combine at Slobozia and a large section of the combine for nitrogenous fertilizers at Piatra Neamt, scheduled for 1972, will also contribute substantially to reach plan targets.[12]

Romania's nitrogen capacity will increase rapidly in the near future. Kellogg International of London, was awarded contract by Romchim, the Romanian trading organization, for two more large ammonia plants. Both plants are duplicates of a unit ordered in 1970 for the fertilizer complex at Tîrgu Mureş and will have a capacity of 907 tons per day (300,000 tons per year). Locations will be at Turnu Magurele and Arad. Each unit will cost about $15.6 million. Construction will be completed by June 1973, when all three units are scheduled to go onstream. For the first unit most equipment will be delivered by Kellogg from the West; in the following contracts, Western components were considerably reduced. Romania has bought only the engineering expertise; procurement and construction will be handled by Ipran, the Romanian inorganic chemistry and fertilizer engineering organization. Kellogg will be on hand for advising, but equipment will come, if possible, from Romania. The Turnu Magurele complex has already two 300,000-ton-per-year ammonia plants.[13]

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[9] Scînteia, Bucharest: In toate ramurile productiei . . . etc. (Article on mining & geological industries by prof. dr. ing. Bujor Almasan, Minister of Mining and Geology). V. 40, No. 8666, Jan. 14, 1971, p. 1.

[10] Scînteia, Oct. 22, 1971, p. 3.

[11] Cement, Lime and Gravel World Cement News. V. 46, No. 10, October 1971, p. 254.

[12] Scînteia (Bucharest). V. 41, No. 9077, Jan. 7, 1972, col. 1, pp. 1, 3.

[13] European Chemical News (London). Ammonia orders herald Romanian fertilizer boost. V. 19, No. 480, May 14, 1971, p. 14.

The French Société Chimique de Grande Paroisse won a contract for a nitric acid process unit at the Arad fertilizer complex. It is assumed that two 725-ton-per-day nitric acid units will be built, linking up with Kellogg's ammonia plant there. The Western European company will handle process design and basic engineering, and Ipran will be responsible for detailed engineering and the remainder of the contract.[14]

Evence Coppée-Rust SA has been awarded a contract for a 300,000-ton-per-year urea plant to be built at Tîrgu Mureş at an estimated cost of $8 million. The plant will operate according to the Stamicarbon N.V. process.[15]

An identical second urea plant, awarded to Coppée-Rust, will be built at Piatra Neamt/Savineşti.[16]

Complex fertilizers will have a leading role in the fertilizer plant additions to go onstream during the current 5-year plan. By 1975, Romania's nitrogen capacity is estimated to reach just under 2.1 million tons per year. This means a capacity increase of 916,000 tons of nitrogen per year, of which about 58 percent will be for complex fertilizers, 30 percent for urea, and the remainder for ammonium nitrate.

In 1971, complex fertilizer project contracts were awarded by Romchim to the Wellmann-Power Gas, Inc., of the United States, a Davy-Ashmore Co., Ltd., using the Nitrogen-Phosphorus-Kalium (Potassium) (NPK) process of Norsk-Hydro-Elektrist Kvaelstofaktieselskab. In March and April, 1971, Wellmann-Power Gas, Inc., was awarded the contracts for two 2,700-ton-of-NPK-per-day units to be located at the existing Turnu Magurele nitrogen complex and one at a new location at Arad, near the Hungarian border. The third and fourth similar NPK plants are expected to be located at Tîrgu Mureş and Craiova.[17]

In the phosphatic fertilizer expansion program, a third single superphosphate plant came onstream in June at the Năvodari chemical works. The new plant has a granulating capacity of 180,000 tons per year for single superphosphate. A 200,000-ton-per-year sulfuric acid plant was commissioned in the previous year. By 1972, there will be additional capacity of 350,000-tons-per-year granulated triple superphosphate, and two other plants will produce 60,000 tons of equivalent phosphorous pentoxide as phosphoric acid, based on the UCB S.A.–St. Gobain process.[18]

Geomin, the Romanian mining consultant company, contributed design, equipment, and technical assistance for a Syrian phosphate complex for 500,000 tons of phosphate ore, or 300,000 tons of high-grade concentrate at Khneifiss.[19]

Sulfuric Acid.—A second sulfuric acid plant with a capacity of 200,000 tons per year went onstream at the Valea Călugărească chemical combine; work has been started on a third plant.[20]

MINERAL FUELS

Romania has various energy resources, mostly in limited amounts such as lignite, coking coal, crude oil, natural gas, and some bituminous schists.

The largest power stations, fuel used, and nominal power in megawatts, with date of completion if not operational, are as follows: [21]

Site	Fuel	Power megawatts (completion if applicable)
Craiova	Lignite	980
Rovinari	do	1,720 (1971–76)
Deva	Low-grade bituminous coal.	840 (1972)
Brăila	Fuel oil	1,620 (1973–77)
Borzeşti	Fuel oil and gas	635
Luduş	Low-pressure gas	800
Iron Gates	Hydropower	1,050
Argeş	do	220
Someş	do	265
Bicaz	do	210 (1972–74)
Lotru	do	510 (1973–75)

In 1970, high-voltage transmission lines included 1,286 kilometers of 400-kilovolt lines, 1,870 kilometers of 220-kilovolt lines, and 7,470 kilometers of 110-kilovolt lines. The high voltage system links the Romanian power system to the neighboring countries. The 400-kilovolt line from Luduş, Romania, to Lemesany, Czechoslovakia, crosses through the U.S.S.R. at Mukhacevo, and from there connects to Hungary. There are also a 220-kilovolt link to Bulgaria and 110-kilovolt system, to be expanded to 400 kilovolt connecting Yugoslavia.

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[14] European Chemical News (London). Grande Paroisse mines mitric acid on tract for Arad complex. V. 19, No. 481, May 21, 1971, p. 20.

[15] Nitrogen, New Plants and Projects—Romania, No. 69, January-February 1971, col. 3, p. 12.

[16] Nitrogen, New Plants and Projects—Romania, No. 71, May–June 1971, col. 1, p. 14.

[17] Nitrogen, (London), World Markets—Romania. Further moves to complex fertilizers, No. 73. September–October 1971, cols. 1 and 2, p. 13.

[18] Phosphorus and Potassium, (London). New plants and projects, Eastern Europe, Romania, No. 55, September–October 1971, cols. 1 and 2, p. 10.

[19] Industrial Minerals (London). No. 50, November 1971, p. 40.

[20] Chemical Age. V. 103, No. 2719, Aug. 27, 1971, p. 15.

[21] Energy International Romanian Energy Report. V. 8, No. 6, June 1971, pp. 24–29.

There seems to be a change in Romania's nuclear power plans because it was announced that the first nuclear powerplant is scheduled for 1978, later than the 1971–75 year plan for which it was originally planned.

Coal.—In 1970, Romanian total run-of-mine coal production increased insignificantly, corresponding to a 96.8-percent plan fulfillment. The reason for this was that no important new consumers entered the market. For the end of the current 1971–75 5-year plan, production plans are as follows, in thousand metric tons:

Year	Plan
1971	23.7
1972	27.4
1973	29.5–30.5
1974	32.5–33.0
1975	37.0–38.5

For 1980, coal production estimates exceed 50 million tons per year.

On January 1, 1971, Romania's coal reserves were as follows, in million tons: [22]

Bituminous coal	952
Lignite	3,546
Other	72
Total	4,570

Geological activities in prospecting for coal resulted in the mapping of the lignite reserves of Oltenia. This mapping made it possible to open up five mines in the Motrul basin and five open pit mines in the Jiul basin. These mines will be followed by underground and open pit mines in the Jiltul basin to supply fuel for the new thermoelectric power centers at Işalnita and Rogojelu, each with a power of 1,000 megawatts.[23]

In 1970, the structure of Romania's coal consumption based on standard coal units was as follows, in percent: [24]

Coke and semicoke	12.5
Thermal powerplants	56.2
Other industries	11.2
Transportation	11.0
Households	9.1

Petroleum.—In 1971, Romanian petroleum production exceeded the 1970 output only moderately, corresponding to a plan fulfillment of 100.6 percent. No spectacular increases in the future are expected for petroleum production, as can be seen in the following tabulation, which shows the current 1971–75 5-year plan figures, in thousand metric tons:

Year	Production
1971	13.7
1972	14.0
1973	14.1
1974	14.3
1975	14.3

Proven Romanian crude oil reserves at yearend 1970 were 867 million barrels,[25] unchanged from 1969.

Drilling for oil in 1969, the last year for which figures were available, was 1,308,716 meters (4,291 thousand feet).

Investments in the oil (and gas) industry in 1969 were 4,041 million lei, 11.2 percent of the nation's total industrial investments.

Romanian goals for petrochemicals are very ambitious. Petrochemical feedstock production is to be expanded. Ethylene production will triple, to 330,000 metric tons per year by 1975.[26]

The stabilized domestic crude output continued to be supplemented from abroad by mutual ventures with foreign countries. The Romanian Petrolexport Trade Co. concluded an agreement with Algeria for importing 500,000 metric tons in 1972.[27]

The Geomin Trading Co. of Bucharest agreed with the Algerian Sonatrach Co. for establishing a Romanian-Algerian company for exploration services and oil field equipment within the framework of the 1971–73 bilateral Romanian Algerian trade pact.

Romania is loaning $35 million to Iraq at 2.5 percent interest for oil exploration in return for Iraqi crude. Joint construction of refineries is also planned.

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[22] Energetica. Coal production and use in Romania by Prof. dr. eng. Bujor Almasan, Minister of Mines, Petroleum and Geology.

[23] Viata Economica, Geological activities in the field of mineral exploration projected. By prof. Virgil Ianovici, First Deputy Minister of Mines, Petroleum and Geology. (Bucharest), No. 4, Jan. 28, 1972, pp. 7, 9.

[24] Work cited in footnote 22.

[25] World, Oil Summary of Eastern European petroleum industry activities—1970–1969. V. 173, No. 5, October 1971, p. 119.

[26] Chemical & Engineering News. Romania has ambitious chemical goals. V. 49, No. 32, Aug. 9, 1971, pp. 22–25.

[27] OPEC Weekly Bulletin. Romania: Petroleum Dominates Recent Trade Pacts. V. 3, No. 13, Mar. 31, 1972, p. 15.

Romania has considered participation with Egypt in the projected Suez-Mediterranean pipeline construction. Romania is providing $100 million credit in goods and services and would like to receive gulf crude via the pipeline.

Romania has conducted an active barter trade with Iran, also a crude oil supplier.[28]

There were talks between Romania and the State of Hesse, West Germany, concerning the possibility of Romania building an oil refinery there. If built, the refinery might be supplied with crude from an extension of the U.S.S.R.-East German pipeline from Merseburg.[29]

Shell Oil Co. announced the conclusion of a long term agreement with Romania for cooperation in the fields of the petroleum and petrochemical industries, including sale and purchase of various products and provision of various services.[30]

Natural Gas.—In 1971, natural gas production increased by 6.7 percent over 1970, corresponding to a plan fulfillment of 101.4 percent. The current Romanian 1971–75 5-year plan for the production of natural gas is as follows, in billion cubic feet:

Year	Quantity
1971	749
1972	784
1973	795–828
1974	848–890
1975	901–946

In 1969, the last year for which figures are available, 248,515 meters (757,901 feet) were drilled, down from 282,583 meters in 1968.[31]

Also in 1969, there was news of the existence of one underground gas-and-oil type gas storage unit of 800 million cubic meters maximum capacity that stored 38 million cubic meters of natural gas in 1969.[32]

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[28] Journal of Commerce, Mar. 20, 1972.

[29] Chemical Age. Romania in talks to build refinery in West Germany. V. 103, No. 2720, Sept. 3, 1971, p. 4.

[30] Petroleum Press Service (London). Romania. V. 38, No. 7, July 1971, p. 272.

[31] Oil and Gas in Romania (Bucharest). No. 8, 1971, pp. 3–8.

[32] Petroleum Times (London) Development of underground fuel storage in Canada and Europe. V. 75, No. 1925, Nov. 5, 1971, pp. 33–34.

The Mineral Industry of Sierra Leone

By Henry E. Stipp [1]

Sierra Leone's economy continued in a depressed condition in 1971, largely because of a decrease in the sale of diamonds. Export of diamonds normally accounts for about 65 percent of the value of total exports and about 20 percent of Government revenues. Approximately 80 percent of Sierra Leone's diamonds are gem quality and are sold in the United States. The value of diamond purchases by the Government Diamond Office (GDO) rose sharply in October and continued at a high level through the yearend. Purchases of rough and uncut diamonds by the GDO totaled 1,031,090 carats valued at $30.3 million in 1971, compared with 1,048,875 carats valued at $31.4 million in 1970.[2] The increase in value of GDO diamond purchases in the latter part of the year was attributed to the rise in demand for diamonds during the world currency crisis and an increase in the price for diamond on the world market.

The Minister of Lands and Mines reported that a geological and mineral survey of the Tonko Limba Chiefdom, northwestern Sierra Leone, was being carried out by a team of British and Sierra Leonean geologists.

In October the Government of Sierra Leone revoked the mining lease and dredging license that had been granted to Sherbro Minerals Ltd. in 1964. Sherbro, 80 percent owned by PPG Industries, Inc. and 20 percent by British Titan Products Ltd., suspended mining operations on its rutile concession at Gambatoke, Bonthe District, on April 7. About 800 workers were without jobs as a result of the Sherbro shutdown; however, the Government hoped to have the facilities operating again in a short time. At yearend, the Sierra Leonean Government was negotiating with another firm to take over the mining lease and facilities formerly owned by Sherbro.

Reportedly, the Government was studying proposals by International Materials Corp. of Canada to acquire the Sierra Leone cement factory. The cement plant located at Cline Town closed down in 1970 and all of the country's requirements for cement are supplied by imports mainly from the Arab Republic of Egypt and East European countries.

The Federal Republic of Germany was constructing a road from Lunsar to Sefadu in the area of the diamond fields. The road will facilitate transport of equipment and supplies and probably lead to expanded development of diamond mining.

Sierra Leone's Minister of Development commissioned a Canadian and Italian Consortium to begin preliminary engineering studies, field surveys, and technical and feasibility studies on the Bumbuna Falls hydroelectric power project. The consortium of Salini Construttori, Canadian International Comstock Co. Ltd., and Tecsult International Ltd. will submit a report to the Government, which will form the basis for construction of the electric powerplant and ancillary facilities.

Although the Government had previously announced its intention to obtain a controlling interest in all mining organizations operating in Sierra Leone, at yearend 1971 only the diamond mining firm, Sierra Leone Selection Trust Ltd. (SLST), had been reorganized. The new diamond mining firm, National Diamond Mining Co. (Sierra Leone) Ltd. (DIMINCO), was legally incorporated in October 1970; the Sierra Leone Government will own 51 percent of the authorized share capital of $12 million and SLST will own 49 percent of the share capital. The Government pledged to reduce illicit mining on DIMINCO concessions.

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[1] Physical scientist, Division of Ferrous Metals.

[2] Where necessary, values have been converted from Leones (Le) to U.S. dollars at the rate of Le 1=US$1.20.

Table 1.—Sierra Leone: Production of mineral commodities

Commodity[1]	1969	1970	1971[p]
Bauxite thousand metric tons	454	440	590
Cement do	44	[e] [r] 30	--
Diamond:			
Gem[e] thousand carats	736	723	716
Industrial[e] do	1,253	1,232	1,219
Total do	1,989	1,955	1,935
Iron ore thousand metric tons	2,374	2,295	2,548
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	320	322	337
Kerosine and jet fuel do	163	245	272
Distillate fuel oil do	376	525	518
Residual fuel oil do	813	803	884
Other do	242	38	182
Refinery fuel and losses do	133	82	
Total do	2,047	2,015	2,193
Titanium minerals, rutile metric tons	28,467	44,083	11,932

[e] Estimate. [p] Preliminary. [r] Revised.

[1] In addition to the commodities listed, marine salt was produced for the first time on a commercial basis in 1970, but no output statistics are available.

Table 2.—Sierra Leone: Exports of selected mineral commodities

Commodity	1969	1970
Aluminum, bauxite thousand metric tons	442	[1] 423
Diamond:		
Uncut and unworked thousand carats	1,852	1,946
Cut and polished do	12	9
Iron ore thousand metric tons	2,417	2,427
Iron and steel semimanufactures metric tons	NA	14,080
Rutile do	16,094	[1] 17,855

NA Not available.

[1] From import data of partner countries.

Table 3.—Sierra Leone: Imports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1968	1969[1]
METALS		
Aluminum and alloys, all forms	299	148
Copper and alloys, all forms	48	35
Iron and steel semimanufactures	15,910	14,312
Lead and alloys, all forms	27	--
Tin and alloys, all forms long tons	5	--
Zinc and alloys, all forms	40	94
NONMETALS		
Cement	14,909	10,226
Diamond, uncut and unworked carats	9,199	(2)
Fertilizer materials, crude and manufactured	1,516	1,090
Gypsum and plasters	5,886	--
Lime	276	--
Salt	8,990	6,686
Sodium compounds n.e.s., caustic soda	160	192
Stone, sand and gravel	15,395	--
Other crude nonmetallic minerals	4	12
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	81	612
Coal, coke and briquets	305	--
Petroleum refinery products:[3]		
Gasoline	[r] 408	22
Kerosine and jet fuel	[r] 319	26
Distillate fuel oil	[r] 1,016	299
Residual fuel oil	[r] 108	37
Lubricants	[r] 220	2
Other	[r] 171	104
Total	[r] 2,242	490

[r] Revised.

[1] Except for petroleum data, compiled from import statistics of trading partner countries presented in Statistical Office of the United Nations. 1969 Supplement to the World Trade Annual (V. 3 Africa). Walker and Co., New York, 1971.

(2) Unspecified quantity valued at $3,035,000.

[3] Source: U.S. Bureau of Mines, International Petroleum Annual, 1968 and 1969 editions.

Source: Except where otherwise noted, official trade returns of Sierra Leone.

COMMODITY REVIEW

METALS

Bauxite.—Production of bauxite in 1971 increased sharply (34 percent) over the 440,000 tons produced in 1970, owing mainly to a substantial rise in output during the second half of the year. Completion of a second washing plant in January gave combined production capacity of 600,000 tons of bauxite per year. Bauxite mining operations are located at Mokanji, Moyamba district, Southern Province. The open pit mine is operated by Sierra Leone Ore and Metal Co. Ltd. (SIEROMCO), a subsidiary of Suisse Aluminium Industrie A.G.

Iron Ore.—Production of iron ore by Sierra Leone Development Co. Ltd. (DELCO) increased about 11 percent from the 2,295,000-ton output of 1970. Work continued on the Ghafal Hill ore body, Marampa, Northern Province, where Taylor Woodrow Ltd. was removing overburden totaling 240,000 cubic yards. Taylor Woodrow also has contracted to mine 1 million cubic yards of iron ore and transport it to the conveyor belt, which will carry ore to the concentrator 2 miles away. The ore will be transported by railroad 52 miles to Pepel Port for shipment to Japan and to European countries.

Titanium Minerals.—Sherbro Minerals Ltd. suspended operations at its rutile mine located at Gambatoke, Bonthe District, southwestern Sierra Leone, on April 7. The U.S. Export-Import Bank, which had financed most of the purchase of Sherbro's equipment, appointed receivers. A standby crew was retained for care and maintenance of the plant. Sherbro began mining operations in 1967. Reportedly, problems associated with the alluvial deposits, which are in an extremely fine form and disseminated in a lumpy, lateritic clay, frustrated operations from the start and were never entirely overcome.[3] In addition, a dredge operating at Mabimbi capsized in 1968, reducing planned production substantially. Although Sherbro was unable to produce rutile profitably, the deposits on the Sherbro River are still regarded as the largest and richest in the world. Approximately 11 million tons of 0.75 to 1.0 percent rutile ore were proven and estimated, and additional lower grade deposits in the area reportedly are very large.[4] It was estimated that 70 percent of the rutile in proven deposits was recoverable using present equipment.

A new company, Sierra Rutile Ltd., was incorporated at yearend, and was expected to obtain a lease on the rutile concession area at Gbangbatoke from the Government. The company, which is a subsidiary of Nord Resources Co. and Armco Steel Corp. of the United States, was preparing to start operations in early 1972.

NONMETALS

Diamond.—Production of diamonds in 1971 decreased 1 percent from the 1,955,000 carats recovered in 1970. After falling to a low level early in 1971, production increased moderately but was considerably below previous output. Recovery of diamonds by licensed diggers declined in 1971. Diamond dealers recently have been reluctant to invest in financing operations of the small-scale miners, owing to the lower price offered for crude diamonds. Also the best diggings in the alluvial area may have been exploited. Security measures by the Government on the DIMINCO lease also could be making it difficult for illegal miners to recover diamonds. Production of diamonds by DIMINCO decreased 15 percent from output by SLST in 1970.

In November, the price of rough diamonds, marketed by the Central Selling Organization, was raised 5 percent.

A 969.1 carat diamond, the largest ever found in Sierra Leone, was recovered from a DIMINCO conveyor belt.

Salt.—A sea salt recovery plant, located in Kissy Dockyard near Freetown, was established in 1970.[5] Large stocks of both crude salt and finished products of all grades are available. The plant employs 65 nationals and one foreign manager. Locally produced salt is competitive in quality and price with imported salt.

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[3] Industrial Minerals. PPG's TiO_2: First Sherbro Now Natrium. No. 46, July 1971, pp. 32–33.

[4] Engineering and Mining Journal. Sierra Leone's Rutile Down But Not Dead. September 1971, pp. 214–218.

[5] Sierra Leone Trade Journal. Salt Manufacturing Company (S.L.) Limited. V. 11, No. 2, April–June 1971, p. 40.

MINERAL FUELS

A bill ratifying the agreement between the Government and the Sierra Leone Petroleum Refinery Co. was withdrawn from Parliament in February.[6] The agreement, which covered operations of the refinery at Kissy, was criticized as being of more benefit to the oil companies than to the people of Sierra Leone. At yearend the refinery was being operated under a temporary agreement with the oil companies. A plan to enlarge the ocean terminal near the Kissy refinery, so that it can accommodate larger tankers, was reported.[7]

Seismic surveys were being conducted on offshore concession areas granted to Occidental Petroleum Corp., Interocean Oil Co., Union Carbide Corp., and Clinton International Oil Co. in 1970. At yearend the Government granted an oil exploration license to Aracca Exploration Ltd. The license covers 2,000 square miles in the northern coastal area of Sierra Leone.

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[6] Barclays Overseas Review. (London). Sierra Leone. March 1971, p. 18.

[7] World Petroleum Report. Sierra Leone. V. 17, 1971, p. 61.

The Mineral Industry of The Republic of South Africa

By James S. Kennedy [1] and Roderick G. Murchison [2]

The South African mineral industry experienced rising costs, lessened world demand, and lower prices for several major commodity items; this considerably slowed its rate of growth in 1971. International monetary developments, culminating in devaluation of the Rand by 12.28 percent in December, created uncertainties that had a further disruptive effect on the industry. Owing mainly to the higher price of gold on the free market, the value of total mineral production, exclusive of platinum and uranium, data for which are not available, increased by $9.3 million [3] to a record $2,198 million. The gross national product increased 10 percent to an estimated $18.4 billion.

The slump in the international diamond market and the decline in the price of copper, accounting for a combined drop of $58.8 million, were primarily responsible for the decline in mining's contribution to the overall economy. Inflation rose 6 percent during the year, one of the highest rates of increase in the nation's history, raising operating costs and adversely affecting earnings. The tight labor market eased somewhat in line with slackened growth, and total employment in the mining sector declined from an average 661,447 in 1970 to 657,181 in 1971 although shortages of skilled and semiskilled workers continued to present problems for the industry. According to the annual report of the Government Mining Engineer for 1971, comparatively few of the displaced workers from the cutback in platinum production sought employment in gold mines where shortages persisted. Wages and salaries in the mining sector continued to increase amounting to $586.6 million in 1971, compared with $574 million in 1970.

In the metals sector, the Republic of South Africa's first aluminum smelter was completed and began operating at full capacity. Development of the Prieska copper and zinc mine continued with sales contracts arranged for the entire copper concentrate output and the majority of zinc concentrate to be produced. Gold production declined, but value continued to increase as gold prices on the free market rose substantially. Lower grade ore was mined as a result of higher premiums paid to gold producers leading to longer life for many gold mines in the Republic of South Africa. In order to improve efficiency and offset increasing production costs, several gold mining companies consolidated their operations. The South African Iron and Steel Industrial Corp. (ISCOR) continued its major expansion program. Two ferroalloy plants were commissioned, and other major producers continued to expand capacity. Platinum operations were severely curtailed, and production plans were revised. The new platinum smelter of Western Platinum Mines, Ltd., came on stream late in the year. Demand for refined nickel, a byproduct of platinum mining, continued strong, although prices were down throughout most of the year. Plans were made for construction of South Africa's first nuclear power plant, and Palabora Mining Co., Ltd. commissioned its new uranium oxide plant at Phalaborwa.

In the nonmetals sector, demand for asbestos continued strong, and expansion continued, although the market weakened late in the year. Even though cement shortages persisted, the situation eased considerably by yearend as two new plants were commissioned. Production and value of diamond declined owing to reorganization by De Beers Consolidated Mines, Ltd., and falling ore grades. The chemical and fertilizer industry continued to expand. A plant designed for the production of both sulfuric acid and cement from waste gypsum was scheduled to go onstream late in the year.

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[1] Industry economist, Division of Nonferrous Metals.

[2] Regional Minerals Officer, U.S. Consulate General, Johannesburg, Republic of South Africa.

[3] Where necessary, values have been converted from South African Rands (R) to U.S. dollars at a rate of R1=US$1.40.

In the fuels sector, coal mining operations were under expansion to supply increasing domestic and export demand. Large scale open pit operations began at the Optimum colliery after final assembly in July of the Marion 8000 dragline, which should provide considerable information as to the extent such mining can be economically undertaken in the Republic of South Africa. Prospects for continued expansion were enhanced as the result of a long term contract finalized with Japanese steel representatives. A new refinery at Sasolburg began production during the year and others were undergoing expansion.

Despite the lack of long term contracts and varying estimates of total cost, the Government decided to proceed with the Saldanha Bay terminal project, scheduled for completion in 1976. Plans continued for development of the Richard's Bay harbor complex. Completion of these two port facilities and accommodating rail networks will facilitate bulk exports and thus have a pronounced effect on the mineral industry.

PRODUCTION

The upward trend in mineral production slackened considerably in 1971 despite a substantial increase in gold value. Estimated value of mineral output, excluding platinum and uranium, was as follows; in thousand dollars:

Commodity	Value	
	1970	1971
Gold	1,162,470	1,249,963
Silver	6,393	4,965
Diamond (sales)	105,734	90,558
Ores and minerals:		
Local Sales	369,145	366,546
Exports	544,982	486,027
Total	2,188,724	2,198,059

The value of chromite rose 36 percent to $21 million, and gains were registered for iron ore, up 7 percent to $43.4 million, and manganese, up 39 percent to $51.8 million. The value of nonmetallic mineral production increased by 7 percent to $292.6 million, with important gains shown by asbestos, coal, phosphates, and vermiculite.

The value of diamond and silver sales dropped sharply. Metallic minerals declined in overall value by 11 percent primarily as a result of major reductions in antimony, copper, and nickel prices.

Table 1.—Republic of South Africa: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971[p]
METALS			
Antimony concentrate:			
Gross weight	29,615	28,759	23,996
Metal content	18,216	17,370	14,246
Beryllium, beryl concentrate, 11 to 12 percent BeO	313	322	491
Bismuth concentrate:			
Gross weight kilograms	18	--	22
Metal content do	9	--	13
Chromium, chromite, gross weight:			
More than 48 percent Cr_2O_3	102,811	97,116	100,825
44 to 48 percent Cr_2O_3	800,761	934,901	1,031,295
Less than 44 percent Cr_2O_3	294,098	395,242	512,066
Total	1,197,670	1,427,259	1,644,186
Columbium-tantalum concentrate	4	3	1
Copper:			
Mine output, metal content	126,186	149,205	147,700
Metal:			
Smelter	127,300	144,700	150,000
Refined	[r] 61,231	75,348	79,000

See footnotes at end of table.

Table 1.—Republic of South Africa: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971[p]
METALS—Continued			
Gold, primary ... thousand troy ounces	31,281	32,164	31,389
Iron and steel:			
Iron ore and concentrate ... thousand tons	8,788	7,354	10,496
Pig iron ... do	3,931	3,924	3,971
Ferroalloys ... do	424	417	446
Crude steel ... do	[r]4,630	4,757	4,920
Iron and steel semimanufactures:			
Cast iron and steel ... do	396	446	NA
Rolled products ... do	3,087	3,184	3,269
Manganese ore and concentrate, gross weight:			
Metallurgical:			
Over 48 percent Mn	517,663	663,936	689,009
Over 45 to 48 percent Mn	132,101	113,054	86,688
Over 40 to 45 percent Mn	156,404	108,657	239,288
Over 30 to 40 percent Mn	1,330,169	1,666,593	2,140,752
Subtotal	2,136,337	2,552,240	3,155,737
Chemical:			
Over 65 percent MnO$_2$	14,254	10,967	6,784
Over 35 to 65 percent MnO$_2$	53,508	116,265	74,015
Subtotal	67,762	127,232	80,799
Total	2,204,099	2,679,472	3,236,536
Manganiferrous iron ore, 15 to 30 percent Mn, 20 to 35 percent Fe	439,115	374,000	181,637
Nickel, electrolytic	[e]10,000	11,557	12,757
Platinum-group metals:			
Platinum group content of concentrates, matte, and refinery products[e] ... thousand troy ounces	950	1,500	1,250
Osmiridium from gold ores[e] ... troy ounces	14,000	2,800	2,800
Silver metal, primary ... thousand troy ounces	[r]3,335	3,527	3,378
Tin:			
Concentrate:			
Gross weight ... long tons	2,979	3,247	3,364
Metal content ... do	1,847	1,981	1,997
Metal, primary ... do	738	603	703
Titanium minerals:			
Ilmenite	16,505	--	--
Rutile	493	--	--
Tungsten concentrate, 60 percent WO$_3$:			
Gross weight	61	6	12
Tungsten content	29	3	6
Uranium oxide (U$_3$O$_8$)	3,610	3,737	3,800
Vanadium:			
Vanadiferous slag, gross weight, exports	20,926	34,383	[e]35,000
Vanadium content of:			
Vanadiferous slag produced	3,000	4,930	[e]5,040
Vanadium pentoxide	2,593	2,402	[e]2,540
Ammonium vanadate	7	14	
Total	5,600	7,346	7,580
Zinc:			
Concentrate:			
Gross weight	--	14	315
Metal content	--	7	158
Smelter	11,845	27,100	42,400
Zirconium concentrate	263	--	--
NONMETALS			
Asbestos:			
Amosite	89,949	97,380	98,464
Chrysotile	43,555	52,801	61,161
Crocidolite	124,670	137,235	159,671
Total	258,174	287,416	319,296
Barite	3,513	2,920	2,962
Cement, hydraulic ... thousand tons	4,987	5,751	5,859
Clays:			
Bentonite	14,504	16,701	20,634
Fire clay	220,011	223,369	269,396
Flint clay	196,626	301,864	364,413
Fuller's earth	1,130	1,554	1,222
Kaolin	33,160	36,896	39,184
Corundum, natural	229	247	241
Diamond:			
Gem[e] ... thousand carats	3,612	3,758	3,100
Industrial[e] ... do	4,251	4,354	3,931
Total ... do	7,863	8,112	7,031

See footnotes at end of table.

Table 1.—Republic of South Africa: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971[p]
NONMETALS—Continued			
Diatomite	514	848	325
Feldspar	22,036	18,896	12,240
Fertilizer materials, crude, natural, beneficiated phosphate rock thousand tons	1,679	1,685	1,729
Fluorspar:			
Acid grade	55,728	71,199	141,022
Chemical grade	4,503	5,257	13,848
Metallurgical grade	90,045	96,538	84,171
Total	150,276	172,994	239,041
Gem stones, semiprecious:			
Emerald crystals kilograms	1,382	1,500	1,986
Tiger's eye	63	1,045	223
Graphite	459	699	1,145
Gypsum, crude	359,421	410,101	408,236
Kyanite and related materials:			
Andalusite	42,449	42,522	44,471
Sillimanite	28,297	31,916	17,460
Lime	938	1,079	1,093
Lithium minerals (spodumene)	35	9	1
Magnesite, crude	48,121	84,254	78,663
Mica:			
Sheet kilograms	99,894	10,608	2,966
Waste	6,349	7,551	7,160
Pigments, natural mineral:			
Ochers	2,331	2,474	2,314
Oxides	1,180	999	783
Pyrite:			
Gross weight:			
Cupriferous	248,307	260,027	220,797
Noncupriferous	589,024	607,851	528,836
Total	837,331	867,878	749,633
Sulfur content:			
Cupriferous	99,400	104,000	88,300
Noncupriferous	235,600	243,200	211,600
Total	335,000	347,200	299,900
Quartz, quartzite and glass sand (silica)	496,148	542,598	576,909
Salt	377,937	420,060	352,466
Silcrete	9,475	29,083	25,955
Stone, sand and gravel, n.e.s.:			
Dimension stone, marble	22,806	14,029	11,969
Crushed and broken:			
Limestone[1]	10,465	11,537	12,198
Shale	252	358	453
Sulfur, elemental byproduct[e]	12,000	12,000	13,000
Talc and related materials:			
Pyrophyllite (Wonderstone)	4,706	4,821	3,333
Talc	8,813	7,568	8,438
Vermiculite	128,987	121,896	132,070
MINERAL FUELS AND RELATED MATERIALS			
Carbon black[e]	32,000	26,200	28,000
Coal:			
Anthracite thousand tons	1,541	1,678	1,841
Bituminous do	51,211	52,934	56,825
Total do	52,752	54,612	58,666
Coke:			
Oven and beehive do	[r] 3,192	3,185	[e] 3,200
Gashouse, low and medium temperature [e] do	100	100	100
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	17,265	19,962	[2] 22,778
Jet fuel do	584	792	[2] 623
Kerosine do	1,114	2,266	[2] 2,991
Distillate fuel oil do	13,177	14,551	[2] 15,828
Residual fuel oil do	13,992	13,975	[2] 15,298
Lubricants do	662	782	[2] 710
Other do	2,208	3,154	[2] 3,438
Refinery fuel and losses do	4,667	5,181	[2] 5,127
Total do	53,669	60,663	[2] 66,793

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] Local sales plus exports.

[2] Output of four refineries; excludes production from The National Petroleum Refiners of South Africa (NATREF) facility at Sasolberg commissioned in 1971, for which data are not available.

TRADE

According to South African Department of Mines statistics, exports of crude mineral commodities were valued at $486 million in 1971, compared with $545 million in 1970. Antimony, vanadium, and platinum were severely affected by decreased overseas demand and exports declined 65 percent, 13 percent, and an estimated 23 percent, respectively.

Exports of metallurgical-grade manganese increased 44 percent and amosite and Cape Blue asbestos rose 13 percent and 9 percent, respectively. Despite a decline in production value, nickel exports increased 30 percent. Although metallurgical-grade fluorspar declined, other fluorspar exports nearly doubled.

International monetary developments had a considerable effect on trade during the year. On August 15 the United States suspended the convertability of the dollar into gold and imposed a 10-percent import surcharge causing the main trading partners of the Republic of South Africa to float their currencies. The expectation that these currencies would appreciate in relation to the rand helped to maintain imports at a high level while restraining exports. In November, stricter import control measures were imposed by the Government. On December 21, the rand was devalued by 12.28 percent as a result of the realignment of major currencies in the wake of dollar devaluation and in an attempt to stimulate economic growth.

Table 2.—Republic of South Africa: Mineral products trade

(Million dollars)

Products	Exports		Imports	
	1970	1971	1970	1971
Ores and minerals	327	348	202	290
Chemical and associated industries	82	90	225	262
Products of stone, plaster, cement, asbestos, mica, ceramic, glass	12	12	41	47
Gem stones, precious metals, jewelry, coin	308	328	25	25
Base metals and products	367	312	281	331
Total	1,096	1,090	774	955

Source: Monthly Journal of the Department of Commerce and Industries. V. 30, No. 9, May 1972.

Table 3.—Republic of South Africa: Exports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum:			
Oxide and hydroxide	44	2	NA.
Metal including alloys:			
Scrap	1,930	421	NA.
Unwrought and semimanufactures	2,224	2,977	NA.
Antimony, ore and concentrate	30,960	27,522	United Kingdom 11,195; United States 10,863.
Arsenic trioxide, pentoxide and acids	133	472	NA.
Chromium:			
Chromite thousand tons	r 908	1,033	United States 361; Japan 274; West Germany 153.
Oxide and hydroxide	27	15	NA.
Copper:			
Ore and concentrate	14,446	16,455	Japan 14,678; United Kingdom 1,454.
Matte	33	84	NA.
Metal, including alloys:			
Scrap	109	72	United Kingdom 57; Netherlands 15.
Unwrought:			
Blister and other unrefined[2]	r 60,459	58,558	United States 22,053; Japan 18,027; Belgium 7,945.
Refined[2]	58,091	59,363	West Germany 31,579; United Kingdom 19,207.
Master alloys	12	--	
Semimanufactures	3,064	3,325	NA.
Gold, metal, unworked or partly worked[3] troy ounces	1,487	3,768	Japan 1,765; United Kingdom 269.

See footnotes at end of table.

Table 3.—Republic of South Africa: Exports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS—Continued			
Iron and steel:			
Ore and concentrate [2] thousand tons	4,739	5,527	Japan 5,136; Netherlands 354.
Roasted pyrite	1,852	--	
Metal:			
Scrap	9,277	12,164	Japan 1,751; France 693; Taiwan 648.
Pig iron	611,785	454,786	NA.
Sponge iron, powder and shot	166	282	NA.
Spiegeleisen	1,788	1,301	Italy 1,067; New Zealand 234.
Ferroalloys:			
Ferromanganese	253,965	213,424	United States 105,826; United Kingdom 21,573; Italy 20,407.
Ferrochrome	107,472	87,828	United States 17,278; Canada 16,925; West Germany 11,810.
Ferrosilicon	12,913	10,531	Australia 4,070; Japan 1,043; United States 898.
Other	15,105	11,009	West Germany 5,265; Italy 1,190; Belgium 1,016.
Ingots and other primary forms	71,481	21,503	Spain 13,686; Japan 2,869.
Semimanufactures:			
Bars and rods	44,262	44,116	NA.
Angles, shapes and sections	55,002	73,765	NA.
Plate and sheet	201,124	177,035	NA.
Hoop and strip	2,887	2,299	NA.
Rails and accessories	34,583	41,885	NA.
Wire	8,040	11,504	NA.
Tubes, pipes, and fittings	20,564	18,738	NA.
Castings and forgings	790	1,452	NA.
Total	367,252	370,794	
Lead:[2]			
Concentrate:			
Lead	1,505	9,264	United Kingdom 7,210; Japan 2,054.
Lead, vanadium	1,139	2,453	All to West Germany.
Oxide	126	158	NA.
Metal including alloys:			
Unwrought	54,544	48,306	Italy 21,280; United States 10,061; United Kingdom 7,688.
Semimanufactures	158	96	NA.
Magnesium, metal, scrap	53	92	United States 84.
Manganese:			
Ore and concentrate thousand tons	1,821	2,005	Japan 675; Netherlands 469; France 338.
Oxides	11	27	NA.
Metal, electrolytic	9,329	8,857	Canada 1,738; Sweden 1,654; United Kingdom 1,414.
Mercury 76-pound flasks	8	(4)	NA.
Nickel:			
Ore and concentrate	2	16	United Kingdom 12.
Matte, speiss, and similar materials	1	--	
Metal including alloys:			
Scrap	122	41	United Kingdom 17.
Unwrought	5,168	3,454	Italy 981; United Kingdom 766; Netherlands 653.
Semimanufactures	66	185	NA.
Platinum-group, metals, including alloys, all forms[e] thousand troy ounces	900	NA	NA.
Silver:			
Waste and sweepings[5] troy ounces	6,225	261,767	United Kingdom 261,720.
Metal, including alloys[5] thousand troy ounces	3,818	2,500	NA.
Tin:			
Ore and concentrate long tons	2,552	3,091	Netherlands 1,862; West Germany 1,229.
Metal including alloys:			
Scrap do	--	238	NA.
Unwrought and semimanufactures do	23	61	NA.
Titanium oxide	670	221	NA.
Tungsten:			
Ore and concentrate	47	185	West Germany 159; United Kingdom 20.
Metal including alloys, all forms	39	26	NA.
Vanadium, pentoxide (fused)[6]	4,762	5,392	Japan 1,706; West Germany 914; United Kingdom 842.
Zinc:			
Ore and concentrate[2]	[r] 65,619	26,895	United States 11,402; Japan 9,842.
Oxide	235	780	NA.
Metal including alloys:			
Scrap, dust and powder	96	735	NA.
Unwrought and semimanufactures	87	56	NA.

See footnotes at end of table.

Table 3.—Republic of South Africa: Exports of mineral commodities[1]—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS—Continued			
Other:			
Ore and concentrate:			
Of base and precious metals, n.e.s	4,517	1,060	United Kingdom 299; Japan 225; United States 168.
Of molybdenum, tantalum, titanium, vanadium, and zirconium	[r] 6,314	5,656	West Germany 4,824; Japan 484.
Ash and residue containing nonferrous metals	565	4,540	NA.
Waste and sweepings of precious metals troy ounces	1,671	1,275	All to United Kingdom.
Metal including alloys:			
Alkali and alkaline earth kilograms	37	134	NA.
Base metals, n.e.s	281	280	United Kingdom 138; Netherlands 50.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	1	15	NA.
Grinding and polishing wheels and stones	344	304	NA.
Asbestos	278,308	290,380	NA.
Barite	222	63	NA.
Cement	55,750	58,231	NA.
Chalk	342	90	NA.
Clays and products:			
Crude n.e.s.:			
Andalusite, kyanite and sillimanite	53,065	49,490	United Kingdom 10,357; West Germany 7,039; Netherlands 3,898.
Other	200,059	253,586	Japan 102,369; West Germany 71,983; United Kingdom 24,773.
Products:			
Refractory	26,825	36,382	NA.
Nonrefractory[7]	1,245	1,384	NA.
Diamond:			
Gem, unworked and worked thousand carats	3,690	2,906	United Kingdom 2,266; United States 260; Belgium-Luxembourg 241.
Industrial:			
Natural do	9,327	8,038	United Kingdom 6,950; Ireland 943; United States 41.
Manufactured do	4,443	4,642	Ireland 4,622; United Kingdom 20.
Diatomite	85	245	NA.
Feldspar	17,429	15,661	United States 3,691; Italy 3,301; West Germany 2,565.
Fertilizer materials:			
Crude:			
Natural nitrate	2	1	NA.
Phosphate rock	209	229	NA.
Other	1,684	1,589	NA.
Manufactured:			
Nitrogenous	124,729	65,486	NA.
Phosphatic	5,826	7,467	NA.
Potassic	1	5	NA.
Other	1,018	2,244	United Kingdom 1,284.
Ammonia	9,049	3,140	NA.
Fluorspar	113,304	120,381	Japan 65,014; West Germany 24,624; Australia 6,559.
Graphite, natural	64	271	NA.
Gypsum and plasters	13,908	15,492	NA.
Lime	3,940	4,618	NA.
Magnesite	1,698	2,367	NA.
Mica:			
Crude including splittings and waste	11,058	8,967	NA.
Worked including agglomerated splittings value, thousands	$27	$20	NA.
Pigments, mineral:			
Natural, crude	1,380	1,153	NA.
Iron oxides, processed	217	369	NA.
Precious and semiprecious stones, except diamond:			
Precious thousand carats	2,714	1,741	Switzerland 1,620; United States 39; Japan 38.
Semiprecious kilograms	273,296	460,370	United States 123,886; West Germany 101,305; Japan 82,966.
Salt	39,300	43,013	NA.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	38	105	NA.
Caustic potash	106	114	NA.

See footnotes at end of table.

Table 3.—Republic of South Africa: Exports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
NONMETALS—Continued			
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous	2,007	2,412	NA.
Granite	234,487	218,718	NA.
Slate	115	935	NA.
Worked, including slate	309	66	NA.
Dolomite, chiefly refractory grade	11,224	2,626	NA.
Gravel and crushed rock	486	865	NA.
Limestone except dimension	9,641	9,066	NA.
Quartz and quartzite	1,935	1,091	NA.
Sand, excluding metal bearing	2,299	2,329	NA.
Sulfur:			
Elemental:			
Other than colloidal	2,884	517	NA.
Colloidal	39	2	NA.
Sulfur dioxide	1	--	
Sulfuric acid	275	406	NA.
Talc and steatite	259	930	NA.
Vermiculite	104,856	115,768	United Kingdom 29,002; Italy 19,229; West Germany 13,541.
Nonmetals n.e.s.:			
Crude	8,326	15,427	Netherlands 4,824; Japan 2,798; United States 2,558.
Slag, dross and similar waste, not metal bearing:			
From iron and steel manufacture	16,224	20,076	NA.
Slag and ash n.e.s	35	--	
Building materials of asphalt, asbestos, and fiber cement and unfired nonmetals n.e.s ..... value	$933,562	$705,155	NA.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	7,160	4,630	NA.
Carbon black and gas carbon	2,260	3,458	NA.
Coal and briquets:			
Anthracite	825,250	1,202,970	Netherlands 348,394; Japan 341,701; Italy 211,827.
Other	573,254	658,872	NA.
Coke and semicoke	12,190	94,198	NA.
Gas, hydrocarbon, natural and manufactured	3,502	2,707	NA.
Petroleum refinery products:			
Gasoline motor ..... thousand 42-gallon barrels	185	129	Ship and aircraft stores 2.
Kerosine and jet fuel ..... do	543	542	Ship and aircraft stores 460.
Distillate fuel oil ..... do	1,551	1,581	Ship and aircraft stores 1,259.
Residual fuel oil ..... do	18,647	20,682	Ship and aircraft stores 20,679.
Lubricants (including grease) ..... do	321	463	NA.
Mineral jelly and wax ..... do	103	101	United States 38; United Kingdom 16; West Germany 15.
Nonlubricating oils ..... do	15	6	NA.
Pitch ..... 42-gallon barrels	336	1,903	NA.
Bitumen and other residues ..... thousand 42-gallon barrels	[r] 17	47	NA.
Bituminous mixtures, n.e.s ..... do	40	65	NA.
Tar distilled coal, lignite or from peat, and other mineral tar	6,557	2,083	NA.

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[e] Estimate. [r] Revised. NA Not available.

[1] Source: Foreign Trade Statistics. V. 1, 1970, compiled by the Department of Customs and Excise, and includes Botswana, Lesotho, Swaziland, and the Territory of South-West Africa.

[2] Partially or wholly from Botswana, Lesotho, Swaziland, or Territory of South-West Africa.

[3] Industrial gold only, excluding large quantities of monetary gold not reported officially in trade statistics.

[4] Less than ½ unit.

[5] Includes platinum.

[6] See lead for concentrate.

[7] Excluding material reported in orginal source in square yards.

Table 4.—Republic of South Africa: Imports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum:			
Bauxite	16,514	14,046	Australia 9,501; West Germany 257.
Oxide and hydroxide	1,363	15,166	West Germany 13,502; Japan 527; United Kingdom 523.
Metal including alloys:			
Unwrought	41,191	49,119	Canada 41,829; United States 4,220; Norway 1,517; Australia 1,262.
Semimanufactures	6,873	14,167	United States 6,432; Canada 1,938; France 1,047; United Kingdom 1,037.
Arsenic:			
Oxides and acids	18	20	NA.
Metal	206	73	NA.
Chromium:			
Chromite	32,377	21,993	NA.
Oxide and hydroxide	131	6	NA.
Cobalt oxide and hydroxide	15	13	NA.
Copper:			
Ore and concentrate	9,392	7,372	NA.
Metal including alloys:			
Scrap	26	47	NA.
Unwrought	2,727	1,170	NA.
Semimanufactures	2,332	2,644	United Kingdom 1,155; Italy 429; West Germany 256.
Gold, metal, unworked or partly worked troy ounces	11,825	7,821	United Kingdom 4,374; Switzerland 927; West Germany 800.
Iron and steel:			
Ore and concentrate	2	9	NA.
Metal:			
Scrap	18,510	5,223	NA.
Pig iron, ferroalloys, and similar materials	8,967	12,055	NA.
Steel ingots and other primary forms	15,573	109,481	NA.
Semimanufactures:			
Bars and rods	12,123	55,385	Japan 18,128; France 12,564; United Kingdom 7,880; Canada 4,047.
Angles, shapes and sections	9,482	18,759	United Kingdom 6,889; Japan 5,380; Belgium 5,086.
Plate and sheet	67,251	139,383	Japan 95,710; France 14,201; West Germany 10,413; United Kingdom 7,731.
Hoop and strip	5,411	8,558	Japan 3,965; United Kingdom 1,924; West Germany 781; Belgium 315.
Rails and accessories	5,066	5,527	NA.
Wire and wire rod	10,187	10,945	Belgium 3,888; United Kingdom 1,774; West Germany 1,648.
Tubes, pipes and fittings	36,784	39,212	Japan 17,116; United Kingdom 6,711; West Germany 4,356; Sweden 2,264.
Castings and forgings, rough	r 2,715	3,995	United Kingdom 1,668; Australia 587; France 527; United States 451.
Total	r 149,019	281,764	
Lead:			
Ore and concentrate	4	--	
Oxides	87	82	NA.
Metal including alloys:			
Scrap	3,873	5,497	Canada 1,273; Australia 672; United States 392.
Unwrought	7,273	10,493	NA.
Semimanufactures	3,531	121	NA.
Magnesium, metal including alloys, all forms	425	612	Norway 447; United States 139; West Germany 9.
Manganese:			
Ore and concentrate	664	1,797	United Kingdom 1,276; Japan 75.
Oxides	1,994	977	NA.
Mercury 76-pound flasks	1,302	1,024	Spain 385; Italy 177; Turkey 115; United Kingdom 70.
Molybdenum, metal, including alloys, all forms	9	9	NA.
Nickel:			
Ore and concentrate	181	--	
Metal, including alloys, all forms	r 510	561	United Kingdom 290; West Germany 59; Japan 36; United States 36.
Platinum-group metals, including alloys, all forms troy ounces	5,144	3,223	United Kingdom 2,270.
Silicon and tellurium	231	563	Sweden 109; West Germany 94; France 89; Norway 63.

See footnotes at end of table.

Table 4.—Republic of South Africa: Imports of mineral commodities [1]—Continued
(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS—Continued			
Silver:			
Waste and sweeping troy ounces	1,556	175	NA.
Metal including alloys do	193,517	253,169	United Kingdom 43,723; West Germany 41,633; Switzerland 39,689; United States 22,442.
Tin:			
Ore and concentrate long tons	[r] 100	141	NA.
Oxides do	28	55	NA.
Metal:			
Scrap do	13	(2)	NA.
Unwrought and semimanufactures do	466	453	NA.
Titanium (ilmenite):			
Ore and concentrate	25	144	Australia 141.
Oxides	688	975	NA.
Tungsten:			
Ore and concentrate	285	594	United States 143; Australia 69.
Metal including alloys, all forms	41	125	NA.
Zinc:			
Ore and concentrate	2	11,538	United States 10,825; Australia 711.
Oxides	216	188	NA.
Metal including alloys:			
Scrap, including powder and dust	1,692	2,063	Australia 790; United States 355; United Kingdom 60.
Unwrought	8,516	24,894	NA.
Semimanufactures	227	6,022	Australia 3,922; Finland 1,000; Canada 1,000; West Germany 34.
Zirconium ore and concentrate	547	620	Australia 599.
Other:			
Ore and concentrate:			
Of molybdenum, tantalum and vanadium	91	145	Canada 120; United States 25.
Other base metals, n.e.s	2,077	2,007	Australia 1,925; Brazil 52; United States 18.
Ash and residue containing nonferrous metals	2,195	1,208	NA.
Oxides, hydroxides and peroxides of metals, n.e.s	244	268	United States 167; West Germany 42; United Kingdom 33.
Elemental boron, phosphorus and/or selenium	133	100	United Kingdom 57; Canada 10.
Metals, including alloys, all forms:			
Alkali, alkaline earth and rare earth metals	250	13	NA.
Pyrophoric alloys	8	9	NA.
Base metals, including alloys, all forms, n.e.s.[3]	361	471	United Kingdom 188; Japan 68; Belgium 45; Canada 44; Spain 30.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	2,749	4,474	NA.
Grinding and polishing wheels and stones	449	456	West Germany 164; United Kingdom 101; Japan 31; Italy 30.
Asbestos	15,398	17,191	NA.
Barite	4,827	1,823	West Germany 827; United Kingdom 283.
Boron materials:			
Crude natural borates	775	1,285	NA.
Acid	554	745	United States 593; France 138.
Bromine	21	22	NA.
Cement	71,227	277,176	NA.
Chalk	4,615	4,522	NA.
Clays and products:			
Crude clays and refractory minerals	10,723	15,104	NA.
Products:			
Refractory	14,023	17,290	West Germany 5,348; Austria 2,968; United States 2,234.
Nonrefractory	9,044	8,161	NA.
Cryolite and chiolite	55	86	NA.
Diamond:			
Gem carats	55,181	51,344	United Kingdom 26,552; United States 6,715; Switzerland 5,461.
Industrial thousand carats	3,081	3,369	United Kingdom 1,440; Ireland 992.
Diatomite and other infusorial earths	4,112	4,901	NA.
Feldspar, leucite and nepheline syenite	118	78	NA.

See footnotes at end of table.

Table 4.—Republic of South Africa: Imports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
NONMETALS—Continued			
Fertilizer materials:			
Crude:			
Nitrogenous	1,583	681	West Germany 608.
Phosphatic	2	32	NA.
Potassic	126,212	93,655	NA.
Other	459	5	NA.
Manufactured:			
Nitrogenous	3,586	2,488	Italy 800; United Kingdom 608; West Germany 284.
Phosphatic:			
Thomas slag	19,123	11,392	Belgium 11,283.
Other	214	1,095	West Germany 500; Italy 500.
Potassic	27,792	67,346	West Germany 31,979; France 17,218; Spain 4,000.
Other, including mixed	49	12	NA.
Graphite, natural	352	326	NA.
Gypsum and plaster	6,417	6,433	NA.
Lithium minerals not further described	128	586	NA.
Lime	451	405	NA.
Magnesite	83,178	110,326	NA.
Mica:			
Crude, including splittings and waste	177	676	NA.
Worked, including agglomerated splittings	87	63	NA.
Pigments, mineral:			
Natural, crude	311	522	NA.
Iron oxides, processed	2,559	3,458	West Germany 2,725; United Kingdom 611.
Precious and semiprecious gem stones, except diamond value, thousands	$2,234	$1,145	NA.
Pyrite	28	14	NA.
Salt	2,653	2,676	United Kingdom 2,133.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	10,710	22,723	Netherlands 5,730; West Germany 4,652; United States 2,187.
Caustic potash	577	658	NA.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous	1,177	894	NA.
Other	66	177	NA.
Worked	1,252	1,895	Italy 1,357; Portugal 260.
Dolomite	147	247	NA.
Gravel and crushed stone	64,844	3,197	NA.
Limestone	233	514	NA.
Quartz and quartzite	20	41	NA.
Sand, excluding metal bearing	427	541	NA.
Sulfur:			
Elemental:			
Other than colloidal	158,701	167,584	NA.
Colloidal	277	338	NA.
Sulfur dioxide	18	26	NA.
Sulfuric acid	9	7,099	NA.
Talc and steatite	2,433	2,050	Italy 1,178.
Other nonmetals, n.e.s.:			
Crude	1,471	1,042	Australia 242; United Kingdom 197.
Slag, dross, and similar waste, not metal bearing:			
From iron and steel manufacture	24,898	38,969	Canada 38,280.
Slag and ash, n.e.s	64	266	NA.
Oxides and hydroxides of magnesium, strontium and barium	180	186	NA.
Iodine and fluorine	12	4	NA.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	1,582	1,724	NA.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	10,423	18,034	United States 11,417; Netherlands 607.
Carbon and carbon black	4,221	4,569	NA.
Coal, all grades including briquets	19,083	60,720	NA.
Coke and semicoke	7,409	7,536	NA.
Gas, hydrocarbon, natural	553	851	NA.
Hydrogen and rare gases	78	33	NA.
Peat	223	351	NA.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	56,410	63,661	NA.

See footnotes at end of table.

Table 4.—Republic of South Africa: Imports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Refinery products:			
Gasoline, motor thousand 42-gallon barrels	4,524	3,295	Netherlands Antilles 153; 3,142 unreported.
Kerosine (including jet fuel) and white spirit do	3,636	2,943	United States 35; 2,908 unreported.
Distillate fuel oil do	3,777	4,308	United Kingdom 367; Australia 260; 3,681 unreported.
Residual fuel oil do	6,091	8,252	NA.
Lubricants (including grease) do	924	1,040	United States 387; United Kingdom 214.
Jelly and wax do	186	237	United States 90; West Germany 49; Japan 44.
Other:			
Nonlubricating oils, n.e.s. do	6,605	5,346	Italy 141; United States 57.
Pitch 42-gallon barrels	2,547	4,983	United Kingdom 2,805.
Pitch coke do	193	--	
Petroleum coke do	33,270	33,468	All to United States.
Bitumen and other residues do	31,101	17,720	United States 10,551; Netherlands 5,945.
Bituminous mixtures, n.e.s do	3,054	2,085	NA.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals thousand 42-gallon barrels	268	269	NA.

[r] Revised. NA Not available.

[1] Source: Foreign Trade Statistics. V. 1, 1970, compiled by the Department of Customs and Excise, and includes Botswana, Lesotho, Swaziland, and the Territory of South-West Africa.

[2] Less than ½ unit.

[3] Includes some manufactures, not separable from unwrought and semimanufactures in source.

Table 5.—Republic of South Africa: Major domestic mineral sales in 1971[1]

Commodity	Thousand dollars
METALS	
Chromite	3,761
Copper	46,076
Iron ore	17,271
Manganese ore	8,090
Nickel	9,265
Tin	1,944
NONMETALS	
Andalusite and sillimanite	572
Asbestos	4,710
Clays	2,823
Feldspar	817
Fluorspar	748
Gypsum	1,542
Limestone	14,382
Lime products, burnt	11,432
Magnesite	1,012
Phosphate rock	14,693
Pyrite (for sulfur)	5,110
Salt	4,506
Silica	3,084
Slate	2,238
Stone, dimension	1,536
MINERAL FUELS AND RELATED MATERIALS	
Coal	153,340
MISCELLANEOUS	
Other minerals	57,594
Total	366,546

[1] Does not include gold, silver, and diamond, data on which are not available.

Source: Republic of South Africa, Department of Mines. Quarterly Information Circular. October–December 1971, pp. 29–30.

Table 6.—Republic of South Africa: Major mineral exports in 1971

Commodity	Thousand dollars
METALS	
Antimony, concentrate	7,092
Chromite	16,520
Copper	105,483
Gold[1]	1,249,963
Iron ore	26,514
Manganese ore	43,243
Nickel	21,087
Silver[1]	4,965
Tin, concentrate	4,523
Vanadium[2]	23,645
NONMETALS	
Andalusite and sillimanite	2,224
Asbestos	48,789
Clays	6,478
Diamond[1]	90,558
Feldspar	582
Fluorspar	6,639
Gem stones, semiprecious	651
Limestone	569
Mica	456
Salt	370
Stone, dimension	7,244
Vermiculite	3,122
MINERAL FUELS AND RELATED MATERIALS	
Coal	13,788
MISCELLANEOUS	
Other minerals[3]	147,008
Total	1,831,513

[1] Total value, including domestic sales, if any.
[2] Includes slag, poly- and metavanadate, fused pent-oxide, ferrovanadium, and Carvan.
[3] Mainly platinum and uranium.

Source: Republic of South Africa, Department of Mines. Quarterly Information Circular. October–December 1971. pp. 31–32.

COMMODITY REVIEW

METALS

Aluminum.—The 50,000-ton-per-year, $67 million aluminum smelter of Alusaf (Pty.) Ltd., a joint venture of Alusuisse, the Swiss aluminum company, Industrial Development Corp. (IDC), and Barlow Rand Ltd. (Thomas F. Barlow & Sons Ltd. acquired Rand Mines Ltd. and changed the name to Barlow Rand Ltd. on June 28) began operating at full capacity in June and was officially opened in October. During 1971 the plant used alumina imported from Europe as feedstock. Beginning in 1973 alumina will be imported from the Alusuisse bauxite development in Gove, Northern Territory, Australia, under the terms of a 20-year contract. The aluminum plant, designed for an ultimate annual capacity of 300,000 tons, is the first stage in the $560 million industrial development program for the Vryheid-Empangeni-Richards Bay region, Natal.

Usco Cable Co. (Pty.) Ltd., a subsidiary of Union Steel Corp. of South Africa Ltd., was formed in partnership with Southwire Co. of the United States to produce and market an aluminum alloy used in insulated wires and cables. A new plant, adjacent to Usco Aluminum Corp's wire and conductor plant at Richard's Bay, is planned.

Antimony.—Production of concentrates by Consolidated Murchison (Transvaal) Goldfields and Development Co. Ltd., the largest single producer in the free world, was reduced as a result of lessened world demand, primarily in the United States. Stockpiling increased in an effort to prevent future shortages and price fluctuations such as occurred in 1970. The estimated stockpile on December 31 was 17,631 tons, equivalent to about 9 months' production at current rates. Sinking of the proposed New Monarch deep level shaft was delayed although preparatory work was undertaken for its eventual opening when the market improves.

Feasibility studies were being conducted on establishment of an antimony smelter in the Republic of South Africa by an unspecified company, reportedly a large customer of Consolidated Murchison.

Chromite.—Production continued to increase as exports and domestic demand remained strong although slowing in the last 6 months as a result of declining sales to the ferrochrome and stainless steel markets. Increased production capacity was planned by the major producers to meet demand of the expanding ferrochrome industry and increasing export requirements.

Chrome Mines of South Africa began expansion of its No. 1 concentration plant and installation of additional sorting and screening facilities at its Zwartkop mine, the largest chrome producer in South Africa. Production at the company's Groothoek mine was restricted for several months because of underground caving and flooding. At yearend production had returned to normal, and work had begun on sinking the new No. 5 shaft.

A new system of shafts was completed at the mine of Henry Gould (Pty.) Ltd., near Marikana, and expansion plans were completed for the Winterveld Chrome Mines (Pty.) Ltd. near Steelpoort; both are subsidiaries of Transvaal Consolidated Land and Exploration Co. Ltd.

An $11 million expansion program at the Potgietersrust mine of African Metals Corp. Ltd. (Amcor) began in July, and production at a rate of 250,000 tons per year was planned.

Johannesburg Consolidated Investment Co. Ltd. announced the development of a commerical pelletizing process for chrome. A new chrome processing plant at the Middleburg-Witbank area is planned.

Copper.—*Palabora Mining Co. Ltd.*—Operating data for the Phalaborwa mine, the largest copper mine in the Republic of South Africa, were as follows:

	1970	1971
Ore milled thousand metric tons	18,947	19,087
Average grade percent	0.54	0.57
Production of blister copper metric tons	91,898	97,976
Gross sales (including vermiculite, sulfuric acid, magnetite) value, thousands	$136,080	$112,202

The grade of ore was slightly higher in 1971 because of the increase in cutoff grade from 0.20 to 0.25 percent. Although copper production increased, sales value declined owing to lower copper prices.

O'okiep Copper Co. Ltd.—According to the company's annual report for 1971 operating data for the 11 active mines and three mills were as follows:

	1970	1971
Ore mined and milled thousand metric tons	2,916	3,017
Average grade percent	1.37	1.28
Production of blister copper metric tons	35,850	34,492
Total metal sales value, thousands	$45,930	$34,658

Although the tonnage of ore mined and milled increased, production of blister copper declined as a result of the declining grade of ore. The average cost of production per ton of ore rose from $594 in 1970 to $671 in 1971. Ore reserves at yearend were 27.6 million tons averaging 1.55 percent copper. The 3-year drought and resulting water shortage threatening O'okiep operations ended in the final months of the year.

Messina (Transvaal) Development Co. Ltd.—Production of refined copper increased to 34,814 tons for the fiscal year ending September 30. Production of copper at the Messina mine, at 11,000 tons, was below that planned, and plans for increasing annual output to 12,000 tons were postponed for at least 3 years. Additional development and prospecting was undertaken in the vicinity of the mine to bring more ore into reserve. The company planned to increase copper production to 40,000 tons in 1972 and 43,000 tons thereafter.

Development continued at the Prieska copper (and zinc) mine, a joint venture of Anglovaal, Middle Witwatersrand (Western Areas) Ltd., and United States Steel Corp. Financing for the project was finalized with United States Steel increasing its equity interest to 45.2196 percent in return for providing an additional $17.78 million loan. Ten-year sales contracts were arranged for the entire concentrate output with Norddeutsche Affinerie in West Germany, AMMI S.p.A. in Italy, and O'okiep in South Africa. The company retained the option of increasing or decreasing the amounts sold during the period and/or receiving a percentage of the refined metal produced.[4] Prieska Copper Mines (Pty.) Ltd. was established as a separate entity for future stock exchange listing and removed as a subsidiary of African Triangle Mining, Prospecting, and Development Co.

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[4] South African Mining and Engineering Journal. V. 84, No. 4064, January 1972, pp. 23–31.

Production at Prieska is scheduled to begin early in 1973 at a milling rate of 100,000 tons per year and increasing to 227,000 tons per year in the second half of 1974. Ore reserves, to a depth of 900 meters, are estimated at 47 million tons at 1.74 percent copper. Owing to the extent of mechanization possible, the total labor force is expected to be 2,000 when in full production. Sinking of the main Hutchings shaft, 8.9 meters in diameter, began in May and, according to the annual report of Anglovaal, had reached a depth of 323 meters by the end of September. Construction neared completion on a water pipeline from the Orange River, and arrangements were made with South African Railways to build a 47-kilometer spurline between the mine and Groveton siding, located on the main Prieska-Upington railway line.

The South African National Institute of Metallurgy constructed a pilot plant for testing a new method of copper recovery. In the process, copper concentrate is dissolved, and the copper is collected from the solution by electrowinning.[5]

Gold.—Mine production declined as a result of a drop in grade in the Orange Free State and scaling down of operations on the Central and East Rand. A total of 73.6 million tons of ore was milled during the year, compared with 74.5 million in 1970. Although production declined, value increased to a record $1,250 million as a result of increasing gold prices on the free market. Working costs continued to increase, averaging $11.03 per ton milled in 1971, compared with $10.28 per ton in 1970. Although costs increased and average yield declined, company profits were generally higher as a result of increased premiums paid to producers by the Government. During the year all newly mined gold was sold on the free market plus an additional 7.31 million ounces from official reserves. At yearend these reserves were down to 11.72 million ounces. As a result of devaluation of the rand, the value of gold was raised from the equivalent of $35 to $40 per ounce.

The number of mines receiving government assistance decreased to 19 as Rand Leases ceased production in June. In 1972 these mines produced about 14 percent of total gold output.

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[5] Mining Journal. New Copper Process. V. 277, No. 7112, p. 533.

Table 7.—Republic of South Africa: Salient statistics of gold and uranium production by members of the Chamber of Mines, Transvaal and Orange Free State

		1970	1971
Number of operating gold mines		47	45
Ore milled	thousand tons	74,467	73,615
Production of gold:			
Gross weight	thousand troy ounces	31,795	31,398
Per ton of ore milled	troy ounces	0.427	0.421
Number of uranium–producing mines		10	11
Ore treated for uranium recovery	thousand tons	13,976	14,253
Production of uranium oxide (U_3O_8):			
Gross weight	thousand pounds	8,238	8,377
Per ton of ore milled	pounds	0.59	0.59
Average realized gold price, per ounce[1]		$36.18	$40.40
Premiums from private sales	thousands	$36,753	$149,066
Working profit, gold and uranium	do	$427,076	$470,254
Taxes and lease fees payable to Government	do	$184,292	$191,800
Net dividends	do	$184,846	$184,080
Average number of employees in service:			
Whites		38,845	37,614
Nonwhites		378,101	379,171
Mine development, including shaft sinking	meters	930,600	891,200
Ore reserves, payable	thousand tons	139,125	137,045
Average grade of reserves	troy ounce per ton	0.555	0.553

[1] Includes premiums from private sales.

Source: Chamber of Mines of South Africa. Published by Union Corp., Ltd. Reports and Accounts 1971.

Table 8.—Republic of South Africa: Gold output, by major producers, 1971

(Troy ounces)

Company or mine	Production
Blyvooruitzicht	1,184,630
Bracken	439,424
Buffelsfontein	1,138,905
City Deep	173,842
Crown Mines	99,526
Doorhfontein	705,433
Durban Deep	393,374
East Daggafontein	296,475
East Rand	609,742
Elsburg	301,246
Freddies Consolidated	486,145
Free State Geduld	1,691,844
Free State Saaiplaas	631,145
Grootvlei	289,948
Harmony	1,101,807
Hartebeestfontein	891,721
Kinross	525,597
Kloof	962,655
Leslie	393,049
Libanon	686,226
Loraine	445,037
Marievale	287,859
President Brand	1,476,852
President Steyn	1,013,279
St. Helena	1,132,742
South Africa Lands	364,946
Stilfontein	678,506
Sub Nigel	121,970
Vaal Reefs	1,332,700
Venderspost	482,001
Virginia	390,471
Vlakfontein	293,630
Welkom	772,907
West Driefontein	2,857,659
Western Areas	709,673
Western Deep Levels	1,889,054
Western Holdings	1,813,168
Western Reefs	606,299
Winkelhaak	641,620
Zandpan	329,812
Miscellaneous	755,372
Total	31,398,291

Source: Chamber of Mines of South Africa. January–December 1971.

The Anglo-American Corp. of South Africa, Ltd., which administered 13 mines, reported an output of 12.4 million ounces, or about 39 percent of total South African production, a decrease of 345 thousand ounces from the previous year due to the mining of lower grade ore. The amount of ore milled increased by 468 thousand tons to 25 million tons, and unit costs increased by 8 percent to $11.12 per ton milled. Profits, however, increased by $9 million to $225.8 million. During 1971, the company planned to spend $43 million on expanding the milling rate at Vaal Reefs, Western Deep Levels, and Western Reefs.[6]

On September 20, Western Reefs Exploration and Development Co. Ltd. became a subsidiary of Vaal Reefs Exploration and Mining Co. Ltd. in an effort to coordinate mining operations, increase hoisting capacity, and centralize facilities. At the new Vaal Reefs South mine, two shafts were commissioned and the reduction plant became fully operational, treating ore from both the north and south lease areas. Late in the year the company raised over $44 million through a rights issue, one of the largest by an individual mining company, to finance expansion projects. A mining lease was acquired to the west of Vaal Reefs South and incorporated in the south lease area.

South African Land and Exploration Company Ltd. was limited to 30 percent of normal production in the first half of the year because of flooding. Additional pumping capacity was installed, and production returned to normal by the end of the third quarter.

Construction began on sinking the No. 3 shaft at Western Deep Levels to a depth of 3,657 meters, making it the world's deepest mine, with provisions for later deepening the shaft to 3,962 meters.[7] Production at the mine was adversely affected by ground movements associated with increased numbers of faults and dikes. The No. 4 shafts at President Steyn Gold Mining Co. Ltd. was completed to its final depth of 2,366 meters. The East Daggafontein mine planned to close late in 1972 because of depleted reserves. At Freddies Consolidated Mines Ltd., a total of 2,461,973 shifts were completed by December 31 without a fatal accident.

Consolidated Gold Fields Ltd. administered five mines that produced 6.3 million ounces for the year ending June 30, a 4-percent increase from the previous fiscal year as a result of increased production at Kloof, Libanon, and West Driefontein. The milling rate at Kloof dropped to 112,000 tons per month, about 66 percent of normal, in July as a result of an underground fire and continued at a reduced level through December. In the second half of 1971 agreement was reached for the merger of Gold Fields of South Africa Ltd. (GFSA), a subsidiary of Consolidated Gold Fields, Ltd., based in London, and West Witswatersrand Areas Ltd. (West Wits) effective July 1, 1971. Although the surviving company is GFSA, West Wits will control all mining operations in South Africa and free GFSA from Government restrictions placed on non-South African based companies.

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[6] Engineering and Mining Journal. V. 172, No. 3, March 1971, p. 239.

[7] Skillings Mining Review. V. 60, No. 23, June 5, 1971, p. 20.

Dewatering of the East and West Driefontein mines was virtually completed by yearend as a system of boreholes was established to divert the inflow directly to the pumps of the two mines. Final dewatering of the No. 4 shaft, West Driefontein, was achieved in November, and rock hoisting was scheduled for January 1972. Cost of reclaiming the shaft is estimated at $22.4 million. At East Driefontein the No. 1 shaft was completed to its final depth of 1,533 meters, and the No. 2 shaft had reached a depth of 1,801 meters. Production is scheduled to begin by mid-1972 with an annual milling rate of 600,000 tons expanding to 2,172,000 tons by 1976.

Union Corp. Ltd., administered seven mines, which produced 3,710,230 ounces in 1971, down 185,445 ounces from that of 1970 as a result of closing the East Geduld mine and reduced operations at Grootvlei and Marievale. At Grootvlei mining on the Main Reef horizon was virtually completed as pillars were extracted at the Nos. 3 and 4 shafts, and operations were expected to cease in about 2 years. Marievale is expected to continue operations for 4 years.

Hartebeestfontein Gold Mining Co. Ltd. and Zandpan Gold Mining Co. Ltd., both of the Anglovaal Group, agreed to merge their separate operations effective July 1, 1972. The first operating company of the group, Rand Leases (Vogelstruisfontein) Gold Mining Co. Ltd., established in 1933, discontinued operations with the last underground blast fired on June 30.

Randfontein Estates Ltd., controlled by Johannesburg Consolidated Investment Co., received a low-interest Government loan and continued development of its new mine in the West Rand area. Production is scheduled to begin in 1974 at a milling rate of 100,000 tons per month.

Iron, Steel, and Ferroalloys.—Demand for steel products continued strong in 1971 with orders received by ISCOR increasing 13 percent over those of 1970. The 4,052,000 tons of steel products supplied by the industry for domestic consumption was about 16 percent more than in 1970 and continued to exceed domestic production capacity. Imports substantially increased, supplying 14 percent of domestic demand in 1971 compared with 4 percent in 1970. Manpower shortages and high labor turnover, particularly among skilled personnel, continued to adversely affect the industry and threatened to become more acute as expansion programs continue.

Iron Ore.—According to the annual report of ISCOR for the year ending June 30, a total of 1.7 million tons were shipped from the Thabazimbi mine and 3.4 million tons from the Sishen mine. Expansion plans at Sishen include doubling annual plant capacity to about 6.5 million tons with a further increase to 9 million tons by 1980. Operations at the Donkerpoort deposit were temporarily suspended to provide equipment for work at Thabazimbi.

Magnetitie shipments by Palabora Mining Co. at Phalaborwa totaled 1,014,354 tons. Feasibility studies were completed on a pipeline between Phalaborwa and the port of Lourenço Marques in Mozambique for transport of magnetite slurry.

The Mapochs mine of Highveld Steel & Vanadium Corp. Ltd. continued to produce at an annual rate of 1 million tons and was expanding capacity of 2 million tons per year. Proven ore reserves at the mine are 70 million tons.

The South African Minister of Mines reported total iron ore reserves in the Republic at over 6,000 million tons with average Fe content of 60 percent.[8]

Late in the year, the Government decided to proceed with the Saldanha Bay iron ore terminal project, and tenders were invited for construction of a rail line to ISCOR's Sishen iron ore deposit. Completion of the $400 to $600 million project is scheduled for 1976. At yearend ISCOR was concluding financial arrangements for the project with 80 to 90 percent of the total reportedly raised from foreign sources.

Negotiations continued between ISCOR and Japanese steel representatives on long term iron ore supplies. At yearend, a contract had not been finalized, and resumption of talks were scheduled for early 1972.

Iron and Steel.—ISCOR accounted for 76 percent of total pig iron and steel ingot output and 65 percent of domestic demand in 1971. According to the company's annual report for the year ending June 30, output at the Vanderbijlpark and Pretoria plants was 2.6 million tons of pig iron, 7.6 percent less than the previous fiscal year due to blast furnace reconditioning and renewals. The Newcastle plant produced an additional 835,391 tons of hot metal, of which 781,579 tons were for pig iron and 53,812 tons for ferromanganese production. Despite lower pig iron output, steel ingot production increased 2.8 percent to 3.5 million tons because of the operation of two new arc furnaces at Vanderbijlpark. The company sold 5.4 million tons of steel products valued at $408 million, 22 percent higher than that of the previous fiscal year. At yearend, ISCOR submitted an application to the Government Price Controller for comprehensive steel price increases.

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[8] Metal Bulletin. No. 5659, Dec. 17, 1971, p. 38.

ISCOR's expansion program was again revised on the basis of market trends and technical developments. Plans include capital expenditures of about $1.5 billion to increase annual ingot capacity to 6.75 million tons by 1976 and a further increase to 10.5 million tons by 1982. At Vanderbijlpark, expansion continued to bring annual ingot capacity to 3.7 million tons. Continuous roll-forming and pickling lines were installed, with the commissioning of a continuous strip annealing line scheduled for May 1972. Additional sintering equipment was installed. Construction of a fourth blast furnace, which will have a capacity of 4,000 tons per day, began with production scheduled for early 1973. Production from the iron foundry, currently under construction, is planned for July 1972. A $35 million contract for hot strip mills, representing the first stage of the new $140 million rolling mills complex, was awarded to Mitsubishi Heavy Industries (Japan). At Pretoria, modernization underway will increase capacity to 1.5 million tons of ingot per year. An order was placed for modernization of the heavy mills complex, increasing annual capacity to 54,000 tons. At Newcastle, a contract for civil engineering work was awarded at a cost of $56 million, and an order was placed with Schoelmann A.G., Düsseldorf, for design and construction of a bar-rolling mill with an annual capacity of 550,000 tons. The company also announced plans to build a plant at Saldanha or Sishen with the expectation of exporting 5 million tons of pig iron and semimanufactures worth about $560 million per year.

The fifth prereduction kiln in the iron plant of Highveld Steel & Vanadium Corp. at Witbank was commissioned. Due to recurrent electrode breakages, however, production of hot metal decreased from 360,732 tons in 1970 to 312,127 tons in 1971.

On June 28 Thomas F. Barlow & Sons Ltd. assumed management control of Middleburg Steel and Alloys (Pty.) Ltd. as part of its acquisition of Rand Mines Ltd. According to the company's annual report for the year ending September 30, operating losses for the year were expected to be $6.3 million due, in part, to the writedown of substantial inventories of stainless steel held by the Southern Cross Co. (Pty.) Ltd. and imported at prices above prevailing price levels. At yearend, the company had been reorganized and stocks had been substantially written down in line with market conditions.

Ferroalloys.—Amcor, the largest South African producer, planned installation of two new furnaces at Kookfontein for completion in 1974, increasing its annual capacity to 160,000 tons. South African Manganese Ltd. planned to acquire a 40-percent interest in Amcor's wholly owned subsidiary, Metalloys Ltd., at a cost of $10.5 million. Middleburg Steel and Alloy continued construction of an electric furnace, with an annual capacity of 35,000 tons, scheduled to come onstream in 1972. The $11 million ferrochrome plant of Associated Manganese Mines of South Africa, Ltd. and U.S. Steel at Machadodorp, eastern Transvaal, began production in December. It is estimated that South Africa's share of world ferrochrome production will increase to 25 to 30 percent when the plant reaches its full capacity of 4,000 tons per month.

Heavy Media Materials, a consortium composed of Amcor, ISCOR, and Farbwerke Hoechst A.G. in association with Knapsack A.G., began production of 15 percent ferrosilicon at Amcor's Kookfontein plant for use in heavy media separation plants. The plant has an initial capacity of 5,000 tons per year. Both Amcor and Rand Carbide continued expansion of ferrosilicon production facilities at Witbank.

Ucar Minerals Corp., a subsidiary of Union Carbide, commissioned its plant at Onderstepoort for production of the proprietary product "Carvan." The plant currently produces about 2.2 million pounds of vanadium pentoxide per year.

Table 9.—Republic of South Africa: Ferroalloy producers

Company	Type	Location
African Metals Corp	Ferromanganese and silicomanganese	Kookfontein, Transvaal.
	Charge chrome	Witbank, Transvaal.
	Ferrosilicon, high-grade	Do.
	Ferrosilicon, 15 percent	Koonfontein, Transvaal.
South African Iron and Steel Industrial Corp.	Ferromanganese	Newcastle, Natal.
Middelburg Steel and Alloys Ltd	Ferrochrome, low-carbon	Middelburg, Transvaal.
Palmiet Chrome Corp. (Pty) Ltd	do	Krugersdorp, Transvaal.
Ferroalloys Ltd	Ferromanganese	Cato Ridge, Natal.
Transalloys (Pty.) Ltd	Silicochrome, silicomanganese, ferromanganese.	Witbank, Transvaal.
Rand Carbide Ltd	Ferrosilicon	Do.
Ucar Minerals Corp	Ferrovanadium	Onderstepoort, Transvaal.

Source: South African Mining and Engineering Journal. V. 83, No. 4059, August 1971. p. 19.

Manganese.—South African Manganese Ltd. continued as the principal producer of manganese ore with an output of 2,087,641 tons in 1971. Despite the increase in exports to 1.7 million tons, rail transportation improved with the introduction of block loads of up to 4,000 tons although delays continued to be experienced at Port Elizabeth. Production from the company's new mine in the northwestern Cape Province was scheduled for the first quarter in 1972 at a rate of 400,000 tons per year. Proven ore reserves are estimated to be 50 million tons.

The Associated Manganese Mines of South Africa shipped 1.3 million tons of manganese ore, compared with 904,000 tons in 1970. The company began operation of another mine in the Blackrock area during the year.

Electrolytic Metal Corp. (Pty.) Ltd. (EMCOR), completed its expansion program to increase production of electrolytic manganese from 9,500 to 12,500 tons per year. Long-term contracts were finalized for sale of the entire additional output.

Extensive drilling by ISCOR in the North-Western Cape fields revealed a large area of mineralization with reserves conservatively estimated at 9,000 million tons of manganese ore.[9]

Nickel.—Output of byproduct nickel in matte produced from platinum ores continued to increase. Domestic sales declined to $9.3 million in 1971 from $21.4 million in 1970 with exports valued at $21.1 million in 1971, compared with $16.1 million in 1970. Impala Platinum Mines Ltd. reported a net premium on nickel sales for the 18-month period ending June 30, 1971, of $2.1 million although early in 1971 the market price fell below the producer's price and adjustments were made in order to sell their output.

In November Rustenburg Platinum Mines Ltd. (RPM) began negotiations with International Nickel Co. of Canada, Ltd. for the sale of their output. As a result of RPM's cutback in platinum production, nickel output was down to about 5,000 tons per year. During the year, Robor, a member of the Barlow Rand group, was appointed the South African distributor of nickel produced by RPM, effective January 1, 1972.[10]

The Anglo-American Corp., continued a joint exploration program with the International Nickel Co. of Canada in the northern Transvaal with negative results.

Platinum.—The platinum surplus and weak market price, which began late in 1970, continued throughout 1971. The reentry of Russian offerings in the world market, late in 1970, and success in the recovery of platinum previously lost in nitric acid production further depressed demand. Early in the year prices were substantially reduced, and, for most of the first half of 1971, platinum was traded at a $10 to $15 discount below the revised producer's price, reaching a low of $100 per ounce in April. In September, RPM the largest South African producer, curtailed production to 50 percent of its annual capacity of 1.1 million ounces and further reduced its operations in December. RPM's production is estimated at 500,000 ounces in 1971. As a result of the time required for production cutbacks to influence the output of refined metal, stocks increased substantially during the year. Total industry stocks at yearend were estimated at 500,000 ounces. The labor force of RPM was reduced from about 35,000 under contract in January to about 15,000 by yearend, and profits for the fiscal year ending August 31 dropped to $27.4 million, compared with $48 million in 1970.

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[9] Annual Report of the Government Mining Engineer, South African Dept. of Mines. Johannesburg, 1971, p. 14.

[10] Page 43 of work cited in footnote 4.

Impala Platinum Mines Ltd., produced an estimated 160,000 ounces in 1971 and announced that planned output for 1972 was to be reduced from 300,000 ounces to between 200,000 and 250,000 ounces. Present capacity is 300,000 ounces per year and could reportedly be expanded to 350,000 ounces per year in 1972 if demand increased. A subsidiary, Impala Sales (U.S.), was established in New York.

Western Platinum Mines, Ltd., a joint venture of Lonrho Ltd., Falconbridge Mines Ltd., and Superior Oil Co. of the United States, brought its $4.2 million smelter onstream in December. Matte produced by the new smelter will be shipped to Norway for recovery of nickel and copper. Sales are expected to begin in late 1972 at an annual rate of about 100,000 ounces.

Atok Investments (Pty.) Ltd., a subsidiary of African Triangle Mining, Prospecting, and Development Co. (Pty.) Ltd., continued as the only other active producer, accounting for about 10,000 ounces during the year, and reported the proving of substantially increased reserves.

Brakspruit Platinum (Pty.) Ltd., managed by Transvaal Consolidated Land and Exploration Co., conducted platinum exploration in various parts of the Transvaal. Prospecting was suspended by Rustenburg on areas owned by Potgieterust Platinums Ltd. At yearend, Hanna Mining Co. (Cleveland, Ohio) was negotiating with Amcor regarding the financing of the new Eland mine in the Transvaal.

Silicon.—Dowson and Dobson Ltd., representing a consortium of companies, conducted feasibility studies into establishment of a 30,000- to 50,000-ton-per-day plant to produce silicon metal from its Witkop silica deposit near Pietersburg.[11]

Tin.—Output of tin-in-concentrates at Rooiberg Minerals Development Co. Ltd., South Africa's largest producer, increased 10 percent to a record 1,426 long tons during the year ending June 30. Despite increased output, revenue declined owing to lower tin prices and a 4-percent increase in costs per ton mined. Work began on a new vertical shaft, which is scheduled for completion in mid-1973. An intensive diamond drilling program was undertaken north of the Spruit works, and a large area of tin mineralization was reportedly discovered. The Vellefontein Tin Mining Co. was acquired in order to provide the company with future sources of ore.

Production of Union Tin Mines Ltd. declined 9 percent to 296 long tons of tin-in-concentrate because of the lower grade of ore mined. An extension to the flotation plant to treat more reclaimed slimes was being installed at yearend.

Zaaiplaats Tin Mining Co., Ltd. experienced a continuing fall in production and sales. Ore reserves were reported to be practically exhausted, and the continuation of future operations was threatened.

Uranium.—Despite the world surplus and depressed market price that prevailed during the year, production continued to gradually expand as stockpiling for future processing continued. West Rand continued as the only primary producer with the output of the remaining 10 mines recovered as a byproduct of gold mining. Production capacity of the Nuclear Fuels Processing Corp., which processes the entire output of uranium from gold mines in the Transvaal and Orange Free State, is about 6,000 tons of concentrate per year and is presently operating at two-thirds capacity. South African ore reserves are estimated to be 300,000 tons recoverable at up to $10 per pound.[12] Commissioning of the new $19.6 million mill at the President Brand mine with an annual capacity of 181,000 tons was delayed pending improvement in the uranium market.

Palabora Mining Co. commissioned its $4.2 million plant to produce uranium oxide from its copper ores. Extraction will be accomplished using the process developed by the Extractive Metallurgy Division, Atomic Energy Board (AEB), and the National Institute of Metallurgy.

The Electric Power Commission planned to issue requests for bids in early 1972 on South Africa's first nuclear powerplant to be located near Cape Town. Completion

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[11] Mining Journal (London). V. 276, No. 7802, May 14, 1971, p. 383.

[12] Mining Survey. No. 67, September 1971, pp. 20–24.

Table 10.—Republic of South Africa: Uranium production, by company, 1971

Gold-uranium producer	Gold ore treated (thousand metric tons)	Production U_3O_8 (pounds)	Grade (pounds per ton)
Blyvooruitzicht	858	467,013	0.545
Buffelsfontein	2,861	1,631,856	.571
Harmony	1,949	714,416	.366
Hartebeestfontein	1,833	664,879	.364
Vaal Reefs	2,093	1,431,625	.683
Virginia	614	344,475	.560
West Driefontein	782	501,866	.642
Western Deep Levels	640	338,102	.529
Western Reefs	1,218	726,471	.597
West Rand Consolidated	799	1,078,116	1.349
Zandpan	606	478,676	.789
Totals and average	14,253	8,377,495	.636

Source: Chamber of Mines of South Africa, January–December, 1971.

date for the plant, to utilize enriched uranium, is scheduled for 1977.[13]

The pilot plant of the Uranium Enrichment Corp. of South Africa (UKOR) for testing the new uranium enrichment process developed by scientists at the AEB was inaugurated in August. Negotiations were underway with other unspecified countries for construction of a joint enrichment plant utilizing the new process.

Anglo-American Corp. acquired uranium rights on a large tract near Hartebeestfontein. Exploration is expected to begin later in the decade.[14]

Vanadium.—Highveld Steel & Vanadium Corp., after recording its first annual profit for the year ending June 30, incurred a loss of $2.7 million for the 6 months ending December 31 due to the decline in world steel and vanadium markets and technical difficulties in the iron plant. Expansion continued, and a fifth prereduction kiln was commissioned. During 1971 the company produced a total of 26,286 tons of vanadium slag.

Two unidentified German groups were considering the establishment of a vanadium pentoxide operation near Brits in the Transvaal.

Zinc.—Ten-year contracts were concluded for about 75 percent of the zinc concentrates to be produced at Prieska, beginning in early 1973, with Preussag A.G. Metall, Nordenham, West Germany, and the Zinc Corp. of South Africa Ltd.[15] Ore reserves at Prieska are estimated at 47 million tons averaging 3.87 percent zinc.

NONMETALS

Asbestos.—Demand continued strong during the year although the market for chrysotile, weakened late in the third quarter. Sales of crocidolite by Griqualand Exploration and Finance Co. Ltd., part of General Mining and Finance Co. Ltd., increased to 54,000 tons, despite cost increases and declining ore grades. Expansion of production capacity and an exploration program were underway.

The Penge mine of Cape Asbestos Ltd., the largest amosite mine in the world, accounting for about 94 percent of South African production, completed more than 2 million shifts without a fatality on December 31. The mine has a labor force of 8,000 and produces over 100,000 tons per year.[16]

Cement.—High demand in the construction industry continued to exceed domestic capacity to supply cement, and imports remained high. The shortage of skilled workers and transportation facilities continued to present difficulties for the industry. Expansion proceeded at a high level and by yearend annual capacity had increased by over 2 million tons. In May, Pretoria Portland Cement Co., Ltd. inaugurated its new kiln, with an annual capacity of 600,000 tons, at Germiston. In September, White's South Africa Portland Cement Co. Ltd. opened its new kiln near Lichtenburg, Western Transvaal, with an annual capacity of 600,000 tons, increasing total capacity of the plant to 1,321,000 tons. At its Dudfield plant, Anglo-Alpha Cement Ltd. completed installation of a second kiln with an annual capacity of 800,000 tons, increasing total plant capacity to 1,250,000 tons. The new Bosveld Kunsmis plant at Phalaborwa, which will use waste gypsum to manufacture cement, planned to go on stream late in the year with a daily capacity of 1,000 tons of cement clinker.

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[13] Mining Magazine. V. 125, No. 4, October 1971, p. 364.

[14] Mining Journal (London). V. 276, No. 7086, June 11, 1971, p. 479.

[15] Page 29 of work cited in footnote 4.

[16] South African Mining and Engineering Journal. V. 84, No. 4067, April 1972, p. 40.

Effective July 1, 1971, Pretoria Portland Cement Co., Ltd., Eastern Province Cement Co., White's South Africa Portland Cement Co. Ltd., and Anglo-Alpha Cement Ltd., comprising about 84 percent of total South African cement production, agreed to merge their sales organizations into one, centralizing cement distribution and planning future expansion on an industry-wide basis. The Marketing Organization is expected to handle 100 million 50-kilogram bags of cement per year with a turnover of between $98 and $112 million.

Diamond.—According to the annual report of De Beers, production declined 13 percent because of reorganization in Kimberley and Namaqualand and a fall in grade of the Finsch mine. Sales by the Central Sales Organization at $625 million were 18 percent higher than those of the previous year owing to improvement in demand for gem diamond in the United States, Japan, and Europe. Despite the increase in sales, stocks increased by $49 million and at yearend totaled $307 million. The Diamond Corp., at De Beers subsidiary, continued to purchase large quantities of diamonds from outside sources of maintain price stability. A 5-percent price increase became effective in November with 2 percent representing a currency readjustment. The price was further increased by 5.4 percent in January 1972.

Table 11.—Republic of South Africa: Diamond production, by province

(Carats)

Province	1970 Mine	1970 Alluvial	1970 Total	1971 Mine	1971 Alluvial	1971 Total
Transvaal	2,677,211	22,682	2,699,893	2,606,747	25,192	2,631,939
Cape	4,205,465	1,023,604	5,229,069	3,354,335	840,229	4,194,564
Orange Free State	182,178	393	182,571	204,698	48	204,746
Total	7,064,854	1,046,679	8,111,533	6,165,780	865,469	7,031,249

Table 12.—Republic of South Africa: Diamond sales, by province

(Carats and thousand dollars)

Province	1970 Quantity	1970 Value	1971 Quantity	1971 Value
Transvaal	2,377,916	12,689	2,736,981	14,078
Cape	4,611,558	88,389	3,880,592	71,368
Orange Free State	208,983	4,656	177,209	5,113
Total	7,198,457	105,734	6,794,782	90,559

Table 13.—Republic of South Africa: Diamond production of De Beers Consolidated Mines, Ltd.

(Carats)

Mine	1970	1971
Bultfontein	235,412	156,063
De Beers	266,160	232,063
Dutoitspan	189,750	170,533
Finsch	2,596,028	2,222,995
Jagersfontein	82,233	21,772
Kimberley dumps	214,600	57,272
Koffiefontein	--	78,336
Namaqualand areas	636,871	505,191
Premier	2,490,103	2,436,834
Wesselton	531,926	484,152
Miscellaneous	2,171	2,354
Total	7,245,254	6,367,565

Source: De Beers Consolidated Mines Ltd., Annual Report, 1971.

A new long term mining program was adopted for the four Kimberley mines of Bultfontein, De Beers, Dutoitspan, and Wesselton. In an effort to extend mine life and improve efficiency, a plan was adopted to operate only three of the four mines at any one time. Accordingly, production at the Bultfontein mine was suspended in September with tonnage treated at the other three mines correspondingly increasing. Although the combined tonnage treated from the four Kimberley mines remained about the same, grade declined and carats produced was substantially reduced.

Operations at Koingnaas and Langhoogte were suspended in April and at Dreyers Pan in May to enable the plant to treat gravels from the northern reserves of Annex Kleinzee and increase production of larger stones. Production from Annex Kleinzee was increased in stages to 36,000 carats per month by September. Although the number of carats recovered was reduced, the average stone size increased from 0.51 carats in 1970 to 0.94 carats in the last half of 1971. Construction of a conglomerate crushing plant began at Annex Kleinzee with commissioning scheduled for June 1972.

In May, the Jagersfontein mine was closed after operating for 100 years, and in August the Koffiefontein mine was reopened and operated at 87 percent of capacity in the last quarter.

Fertilizer and Chemical Materials.—Operations of the Phosphate Development Corp. Ltd. (FOSKOR) was as follows for the year ending June 25 of that specified:

	1970	1971
Ore treated:		
Pyroxenite.....thousand tons..	5,919	5,665
Foskorite..............do....	101	427
Grade (percent P_2O_5):		
Pyroxenite..................	7.53	7.47
Foskorite...................	8.45	7.78
Concentrate produced thousand tons..	1,019	947
Sales.....................do....	876	886

Although total production decreased 7 percent as a result of lower grades of ore treated, supply exceeded demand and the balance was stockpiled. Profits declined 34 percent to about $2 million as a result of increased production costs. FOSKOR continued efforts to find an export market for its excess production of concentrate at Phalaborwa. Negotiations were underway with Shar Pur, a joint venture of the Iranian Government and Allied Chemicals of the United States, for up to 400,000 tons of phosphate concentrate per year; a similiar contract was being negotiated with another unspecified country. The value of the contracts are estimated to total $140 million.[17]

African Explosives & Chemicals Industries Ltd. (AE & CI) announced plans to build a $42 million ammonia plant at Midderfontein, pending Government approval. Production from the 300,000-ton-per-year plant, one of the world's largest, is scheduled for 1974.[18] The company's present 100,000-ton-per-year plant will be phased out when the new plant begins production. An additional $46 million is planned for urea, nitric acid, and ammonium nitrate plants at the new complex.

The new sulfuric acid plant of Bosveld Kunsmis, a member of the Federale Group, was scheduled to go on stream late in the year. The plant is the first of its kind to produce both sulfuric acid and cement from waste gypsum.

Palabora Mining reversed its 1970 decision to construct a new plant. Current plans include modification and rehabilitation of existing facilities.

Fluorspar.—The Buffalo mine of General Mining and Finance Co. began construction of a new plant scheduled for commissioning early in 1973 designed to triple present plant capacity. Production during 1971 increased 37 percent to 39,620 tons.

Zwartkloff Fluorspar Ltd. operated its new mine at Warmbaths in the northern Transvaal at its anticipated rate of 43,000 tons for its first full year of operation.

Magnesite.—Romada (Pty.) Ltd., an associate of Magma Mining (Pty.) Ltd., reported the discovery of possibly the largest deposit of magnesite in South Africa. The average chemical composition of the proved 22 million tons located on its property in the eastern Transvaal is as follows: $MgCO_3$, over 80 percent; $CaCO_3$; 8 percent; SiO_2, 3.5 percent; and FeO, 0.4 percent. The company is presently investigating methods to separate the $CaCO_3$ content of the ore.[19]

Vermiculite.—The Vermiculite Division of Palabora Mining Co. Ltd. completed a $3.5 million program to expand and modernize its processing and production facilities. Because of continued expansion, Mandoval Vermiculite, a new subsidiary, was established to handle sales in Southern Africa, Mauritius, and the Seychelles.

MINERAL FUELS

Coal.—Domestic sales totaled 54.8 million tons of bituminous and 0.7 million tons of anthracite for a total value of $154 million, compared with $140 million in 1970. The value per ton, f.o.b., averaged $2.72 for bituminous and $6.47 for anthracite with export prices per ton, f.o.b., averaging $6.33 for bituminous and $12.32 for anthracite.[20] Price increases were requested by mine owners because of higher capital costs of resource development and plant replacement. At yearend several producers were planning either new mines or expansion of existing facilities. Official estimates, based on current rates of consumption, predicted exhaustion of coking coal reserves between 1986 and 1988. Predicted growth of the ferroalloy, foundry, and pig iron producing industries, however, showed a demand of 14 million tons of coking coal annually, three times the present consumption. Increased electric smelting, based on higher efficiency of bituminous coal usage in power plants was suggested as one remedy.[21] Other alternatives were the use of noncoking coal to produce form-coke and the mixing of blend coking coal and coke in the blast furnace.

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[17] Feed and Farm Supplies. V. 68, No. 12, December 1971, p. 30.

[18] South African Mining and Engineering Journal. V. 83, No. 4055, April 1971, p. 53.

[19] Industrial Minerals (London). No. 48, September 1971, p. 35.

The Transvaal Coal Owners Association finalized a contract to supply 27.8 million tons of blend coking coal to eight Japanese steel mills and coke works. Total value of the contract is over $350 million. Delivery is scheduled to begin in October 1972 at a rate of about 101,600 tons per year through 1975 via the port of Lourenço Marques, in Mozambique. Beginning in 1976, deliveries are planned at a rate of 2.97 million tons per year to 1986 via the new harbor at Richard's Bay.

South African Coal Estates, Greenside, Douglas, Koornfontein, Van Dyks Drift, Springbok, and Transvaal Navigation collieries planned installation of special two-stage washing plants to supply the export blend coking coal as well as steam coal suitable for both the domestic and export markets. A railway between Broodsnyersplaas and Ermelo is planned to link the Witbank collieries with existing or planned routes to Richards Bay. Keeve Steyn and Partners, Johannesburg, and Swan Wooster Engineering, Vancouver, were appointed as consultants on delivery from the collieries and loading operation at Richards Bay.[22]

A Marion 8,000 dragline, with an 84-meter boom and a 55–cubic–yard bucket, began operation at General Mining's Optimum colliery. Coal from Optimum is supplied to the Hendrina 2,000 magawatt power station of the Electricity Supply Commission (ESCOM) under terms of a 38-year contract that includes delivery of 431,000 tons per month when the station begins full operation in 1976.[23]

ISCOR completed installation of a form-coke pilot plant for the production of metallurgical-grade coke from noncoking coals at the Vanderbijlpark steelworks and proposed the construction of a plant in cooperation with Anglo-American Corp. At the company's Hoornbosch property, near Ellisras, a 265-meter shaft was completed and a washing plant and other facilities were under construction. A total of 100,000 tons is planned to be mined for form-coke testing. The company installed new loading and stockpile facilities, capacity 36,287 tons, at its Durban Navigation Colliery in Natal. General Mining, Johannesburg Consolidated Investment, Anglo-American, and Barlow Rand drew up preliminary plans for a monthly output of 90,000 tons of low-ash coal for ISCOR's new steelworkers at Newcastle and 130,000 tons of boiler fuel for the Ngagne power station.

During the year ending June 26, the Sigma mine of the South African Coal, Oil, and Gas Corp. Ltd. (SASOL) provided a record 4,092,630 tons for the company's oil-from-coal plant. A pilot plant was commissioned during the year to continue research on direct conversion of coal to liquid fuels and petrochemicals.

Petroleum.—*Exploration.*—The Southern Oil Exploration Corp. (Pty.) Ltd. (SOEKOR) continued to concentrate onshore efforts in the Port Elizabeth and Northern Karoo Basin. During the year seven holes were drilled in the Algoa Basin prior to suspension of drilling in order to further evaluate the area. Offshore efforts were hampered by a shortage of semisubmersible rigs. Two wells were sunk by the rig "Ocean Traveler" near Knysna and the mouth of the Tugela River prior to its return to the North Sea early in the year. SOEKOR acquired, through an affiliate, minority interests in the Odeco Consortium exploring offshore in the vicinity of

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[20] Minerals. Dept. of Mines Info. Circular. October–December 1971, p. 8.

[21] Professor D. D. Howat. Presidential Address, South African Institute of Mining and Metallurgy. Johannesburg, Aug. 25, 1971.

[22] Coal, Gold, and Base Minerals. TCOA Appoints Coal Loading Experts. V. 19, No. 2, April 1971, pp. 71–73.

[23] South African Mining and Engineering Journal. V. 83, No. 4060. September 1971, pp. 29–31.

Durban and the Aquitaine Consortium, which began geophysical studies of Placid International Oil Ltd.'s offshore block south of Mossel Bay. Upon completion, Anglo-American, Shell, Corgroup Investments, and the SOEKOR affiliate will have options to acquire interests in the block by drilling one to three wells. An offshore sublease along the northeast coast was awarded to Southeast Asia Oil and Gas Co. of Houston. The company plans expenditures of $3.5 million over a 3-year period.[24]

SASOL became directly involved in oil exploration for the first time by acquiring a 25-percent interest in an offshore area near Durban where one hole had previously been drilled and abandoned. Companies that have offshore concessions but had yet to drill early in the year were the Atlantic Richfield Group (ARCO) in the Agulhas area, Chevron-Regent in the area immediately to the east of ARCO, Security Resources Petroleum Corp. and Pantepec in the Cape Town area, and Oil Ventures International and Continental Oil further to the north. These companies were required by SOEKOR to announce their intentions to drill by June 30 with actual drilling to begin by the end of June 1972.[25]

Refineries.—Demand for refined petroleum products continued to exceed supply, and efforts were continued to bring refinery capacity in line with expanding consumption. The gross value of sales of SASOL products, including those from the refining of crude oil, increased 14 percent to $114 million for the year ending June 26. Total value of fuel sales increased 18 percent to $72.8 million for the same period. A 0.7 cent per liter increase in the price of gasoline became effective on April 1.

The refinery of National Petroleum Refiners of South Africa Ltd. (NATREF), at Sasolburg, in which SASOL holds a 52.5-percent interest, was officially opened in May, and product distribution began in June. The 55,000-barrel-per-day plant, will receive more than 70 percent of its crude supplies from National Iranian Oil Co.'s (NIOC) offshore fields. NIOC has a 17.5-percent interest in the refinery.

Mobil planned expenditures of $28 million to expand the capacity of its Wentworth refinery near Durban from 58,000 to 92,000 barrels per day by 1974.[26] The contract for expanding the capacity of Shell-BP's Reunion Refinery from 84,000 to 160,000 barrels per day was awarded with completion sheduled for late 1972.

According to the annual report of the South African Torbanite Mining and Refining Co. Ltd. for the year ending June 30, refinery throughput increased to 764,000 barrels, compared with a throughput of 698,000 barrels in the previous year. The increase was a result of the company's inability to fulfill its contract commitments in 1970 owing to interruption of imported crude oil deliveries and its agreement to supply the deficit in 1971. On June 30, the five local companies supplying crude oil were given notice that the existing agreements would terminate on June 30, 1976.

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[24] Petroleum Press Service. V. 38, No. 8 August 1971, p. 313.

[25] Coal, Gold, and Base Metals. The Search for Oil. V. 19, No. 2 April 1971, pp. 51–53.

[26] Petroleum Press Service. V. 38, No. 8 August 1971, p. 313.

The Mineral Industry of the Territory of South-West Africa

By James S. Kennedy [1]

Operations of three major mining companies in the Territory of South-West Africa, Tsumeb Corp., Ltd., The Consolidated Diamond Mines of South-West Africa, Ltd. (CDM), and The South-West Africa Co., Ltd. (SWACO), provide the bulk of available information on mining activity as the South-West Africa Administration continued its policy of not disclosing official statistical data on mineral production. Although a high level of operations was maintained during the year, production of base metals by Tsumeb Corp., metallic concentrates by SWACO, and diamonds by CDM, showed an overall decline. Exploration was actively continued by most companies prospecting in the Territory. Anglo-Transvaal Consolidated Investment Co., Ltd. (Anglovaal) temporarily suspended its joint exploration program with Tsumeb, however, and the latter company discussed continuation of the program with other participants.

The Oamites copper mine of Falconbridge South Africa Exploration Co., Ltd., and International Development Corp., (IDC), an agency of the South African Government, began production during the year, and one important copper ore body was reportedly discovered by another company. Development of the Rossing uranium project continued on schedule as a pilot plant was under construction and a contract was awarded for construction of mining and milling facilities. In the petroleum sector, exploration continued on a limited basis by four companies with concessions in the Territory. The discovery of potential oil-bearing structures was announced by one of two companies conducting onshore exploration.

A nationwide strike of Ovambo tribesmen, who constitute the majority of South-West Africa's mining sector labor force, occurred in mid-December and continued into 1972. The striking workers were reportedly seeking higher pay and modification or abolition of the contract labor system under which they are employed. Mining operations of the major mining companies were affected by the strike; the lead smelter of Tsumeb Corp. was closed at yearend and the copper smelter was operated entirely by European workers.[2]

PRODUCTION AND TRADE

The South-West Africa Administration has not disclosed official mineral production statistics for the Territory since 1966. The only available statistical data on production were derived from annual reports of three major companies operating in the Territory—Tsumeb Corp., Ltd., CDM, and SWACO. Although the Territory traditionally produces a variety of other minerals, production data are not available, and these commodities are not listed in table 1.

Production of black arsenic, cadmium, blister copper, and refined lead by Tsumeb Corp. declined during the fiscal year while mine output of silver was at an increased level. The lower recovery of diamonds by CDM was a result of reduced output from the foreshore area; both the foreshore and sea-mining operations were discontinued during the year as alterations to the mining program continued. Total output of metallic mineral concentrates at the two mining operations of SWACO—Berg Aukas and Brandberg West—was at a reduced level although production of lead vanadate and tin-tungsten showed substantial increases.

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[1] Industry economist, Division of Nonferrous Metals.

[2] Mining Journal. SW Africa Ovambo Strike. V. 277, No. 7114, Dec. 24, 1971, p. 581.

A detailed breakdown of South-West Africa trade statistics are not available as they are incorporated with those of the Republic of South Africa and are not differentiated. Most mineral commodities produced in the Territory are either processed in South Africa or shipped to world markets. The sale of diamonds has traditionally provided the bulk of the Territory's exports. Diamond sales by CDM, roughly equivalent to exports, were valued at over $54 million in 1971, compared with about $60 million [3] in 1970.

Table 1.—South-West Africa: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1969	1970	1971 [p]
METALS [2]			
Arsenic, white [3]	2,217	4,062	3,701
Cadmium:			
Mine output, metal content, recoverable	231	315	266
Metal, refined	191	232	196
Copper:			
Mine output, metal content, recoverable	[r] 32,604	31,393	32,039
Metal, blister	27,482	28,593	26,922
Lead:			
Mine output, metal content, recoverable	65,851	69,884	66,700
Metal, refined	60,859	70,129	58,820
Silver, mine output, metal content, recoverable ....thousand troy ounces	[r] 1,613	1,552	1,757
Tin, mine output, metal content ....long tons	1,008	1,027	949
Tungsten, mine output, metal content	96	63	95
Vanadium, mine output, content of concentrates	502	402	794
Zinc, mine output, metal content	[r] 28,096	46,686	43,697
NONMETALS			
Diamond:			
Gem [e] ....thousand carats	1,923	1,772	1,566
Industrial [e] ....do	101	93	82
Total ....do	2,024	1,865	1,648
Lithium minerals, all types [4]	3,967	6,909	NA

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, South-West Africa, prior to 1967, produced bismuth concentrates, cesium ore, columbium-tantalum concentrates, gold, iron ore, manganese ore, molybdenum concentrates, graphite, lime, mica, precious stones, salt, kyanite and sillimanite, wollastonite, and crude construction materials (clays, stone, sand and gravel). No official statistics have been published since yearend 1966, and available information is inadequate to ascertain whether production has continued, and if so, at what levels.

[2] Data are for years ending June 30 of that stated and were obtained from operating company reports as follows: Tsumeb Corp. Ltd (arsenic, cadmium, mine and blister copper, mine and refined lead, silver, zinc); South-West Africa Co. Ltd. (mine lead, tin, tungsten, vanadium, zinc); South African Iron and Steel Industrial Corp. Ltd. (ISCOR) (tin); Imcor Zinc (Pty.) Ltd, (zinc); Klein Aub Koper Maatskappy Beperk (mine copper, silver).

[3] White arsenic equivalent of black arsenic produced.

[4] Estimate based on recorded imports by selected countries from the statistical territory of South Africa (which includes South-West Africa) minus known production of the Republic of South Africa.

COMMODITY REVIEW

METALS

Total metal sales of Tsumeb Corp., Ltd., the principal producer of copper, lead, zinc, silver, cadmium, and arsenic, decreased 28 percent from those of the previous fiscal year. Lower prices on copper, lead, and cadmium coupled with increased operating costs were the primary factors in the decline. Sales by SWACO, a producer of concentrates of vanadium, zinc, lead, tin, and wolfram, increased 35 percent to about $6 million as a result of increased production of lead vanadate concentrates and higher prices for vanadium.

Exploration and development continued at all operations of Tsumeb Corp., Ltd. Underground development at Tsumeb totaled 7,347 feet of drift, crosscut, raise, and shaft sinking while 7,017 feet of drift, cross-

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[3] Where necessary, values have been converted from South African Rands (R) to U.S. dollars at a rate of R1=US$1.40.

Table 2.—Ore reserves of Tsumeb Corp. Ltd.[1]

	Quantity (thousand metric tons)	Grade (percent) Copper	Lead	Zinc	Sulfur
Positive ore:					
Tsumeb [2]	5,950	4.52	9.37	2.40	--
Kombat	1,740	1.88	2.70	--	--
Matchless [3]	1,986	1.81	--	--	13.02
Probable ore:					
Kombat	1,315	1.91	2.26	--	--
Matchless	303	2.37	--	--	12.07
Tentative ore:					
Tsumeb	1,778	3.81	4.74	1.63	--
Matchless, Western Extension ore body	735	2.20	--	--	15.34

[1] As of June 30, 1971.
[2] To the 36 level.
[3] Above the 950-foot level.

Table 3.—South-West Africa: Operations of Tsumeb Corp. Ltd.

		Year ending June 30 1970	1971
Tsumeb mine and mill:			
Ore mined, gross weight	short tons	571,953	584,824
Ore milled, gross weight	do	550,375	563,584
Metal content:			
Copper	percent	4.06	4.09
Lead	do	12.81	11.83
Zinc	do	4.27	3.83
Silver	ounces per short tons	1.95	2.40
Concentrate production:			
Lead concentrate:			
Gross weight	short tons	148,642	138,723
Metal content:			
Copper	percent	5.79	6.27
Lead	do	43.94	43.56
Silver	ounces per short ton	2.84	4.10
Copper contentrate:			
Gross weight	short tons	20,225	23,153
Metal content:			
Copper	percent	43.55	40.87
Lead	do	10.30	11.24
Silver	ounces per short ton	24.91	23.50
Zinc concentrate:			
Gross weight	short tons	19,397	17,203
Metal content:			
Zinc	percent	53.97	54.28
Cadmium	do	1.16	1.11
Mill recovery (from all concentrates):			
Copper	percent of metal in ore milled	92.95	91.90
Lead	do	92.99	92.28
Zinc	do	43.22	42.06
Kombat mine and mill:			
Ore mined and milled:			
Gross weight	short tons	416,498	428,757
Metal content:			
Copper	percent	2.11	2.05
Lead	do	1.66	2.09
Silver	ounces per short ton	.44	.60
Concentrate production:			
Copper concentrate:			
Gross weight	short tons	26,274	27,095
Metal content:			
Copper	percent	29.64	27.25
Lead	do	4.54	5.90
Silver	ounces per short ton	5.23	5.30
Lead concentrate:			
Gross weight	short tons	8,767	11,915
Metal content:			
Copper	percent	6.60	8.46
Lead	do	59.98	57.58
Silver	ounces per short ton	1.57	2.70
Mill recovery (from all concentrates):			
Copper	percent of metal in ore milled	95.21	95.40
Lead	do	93.23	94.58

Table 3.—South-West Africa: Operations of Tsumeb Corp. Ltd.—Continued

	Year ending June 30	
	1970	1971
Matchless mine and mill:		
Ore mined and milled:		
Gross weight ... short tons	2,653	51,761
Metal content:		
Copper ... percent	1.00	.99
Sulfur ... do	10.38	15.45
Bulk concentrate production:		
Gross weight ... short tons	526	15,268
Metal content:		
Copper ... percent	4.77	3.23
Sulfur ... do	45.70	47.29
Mill recovery (from all concentrates):		
Copper ... percent of metal in ore milled	94.09	96.30
Sulfur ... do	87.27	90.27
Smelting and refining:		
Direct smelting ore ... short tons	22,466	22,432
Average assay:		
Copper ... percent	20.50	19.16
Lead ... do	3.88	4.01
Silver ... ounces per short ton	8.17	7.80
Copper concentrates smelted ... short tons	46,896	50,222
Average assay:		
Copper ... percent	35.75	33.58
Lead ... do	7.04	8.39
Silver ... ounces per short ton	14.13	14.40
Lead concentrates smelted ... short tons	164,130	141,398
Average assay:		
Copper ... percent	5.88	6.47
Lead ... do	44.81	44.83
Silver ... ounces per short ton	3.11	4.00
Metal sales:		
All metals produced ... thousands	$75,010	$54,040
Arsenic:		
Plus 98 percent As_2O_3 ... short tons	1,524	1,054
95 and 98 percent As_2O_3 ... do	80	1,111
Cadmium ... pounds	727,502	768,885
Copper, electrolytic (refined on toll) ... short tons	34,446	29,173
Lead ... do	72,235	69,183
Silver ... troy ounces	1,368,323	1,263,419
Zinc ... short tons	5,862	7,660

cut, and raise were completed at the Kombat ore bodies. A total of 7,069 feet of underground development was completed in preparation of the Matchless main ore body. Underground exploration and development drilling for the three operations totaled 36,643 feet. The No. 7 internal shaft at Tsumeb reached a depth of 1,586 meters, about 4 meters from its planned final depth. Additional drilling is planned in 1972 to determine the justification for sinking the shaft below the 46 level, its present deepest level. A total of 117,919 tons of hydraulic fill from mill tailings and 91,180 tons of sand fill were delivered to the Tsumeb mine. Modernization of surface facilities continued, and increased mechanization was planned for fiscal 1972.

SWACO confined exploratory and development drilling to Berg Aukas but brought ground previously drilled at Brandberg West into reserve. Ore reserves at Berg Aukas, as of June 30, 1971, were as follows:

	Quantity (thousand metric tons)	Grade (percent)		
		V_2O_5	Lead	Zinc
Positive	1,175	0.5	4.0	19.0
Probable	510	.7	6.0	22.0

The ore reserves at Brandberg West were estimated at 8,440,000 tons at 0.20 percent combined metal (tin and wolfram).

At Tsumeb, about 63 percent of production came from stopes and pillars above 30 level and the remainder from stopes on 32 and 34 levels; there was no further development of the ore body below 34 level. Production at Kombat came from stopes above 6 level in the West, Central, and East ore bodies. Additional stopes were developed on 6 level in the West ore body and 4 level on one of the Central ore bodies. Development of stopes on 8 level of the Central and East ore bodies continued. Construction of the 8 level main haulage drive from No. 1 shaft to the Central ore body, begun in the previous fiscal year, was delayed by water-bearing fissures. Mill feed for the Matchless operation consisted of ore from development and the first two stopes on the 100-meter level.

Tsumeb Corp. continued investigation of several prospects in various parts of the Territory, both independently and jointly with SWACO and Anglovaal. Exploration by Tsumeb and SWACO was completed at Asis Ost in the Otavi Valley. The ore body was found to contain 554,000 tons, averaging 1.8 percent copper and 0.2 percent lead in the lower body, and 228,000 tons, averaging 0.7 percent copper and 1.8 percent lead in the upper body. Application was made for a mining grant which will be ceded to Tsumeb under terms of the joint agreement. Tsumeb and Anglovaal continued exploration of several grant areas; at yearend, interest was confined to two concessions near Witvlei, as Anglovaal curtailed its exploration program. Exploration by Tsumeb was completed at the Hohewarte lead-zinc prospect near Windhoek, and consideration was given to abandonment of the mining area.

Arsenic.—A total of 8,199 tons of reverbatory and converter baghouse dusts and 12,763 tons of dross skims were roasted at Tsumeb resulting in 3,896 tons of black oxide during fiscal year 1971, a decrease of 9 percent from the fiscal 1970 output. The arsenic refining furnaces produced 1,340 tons of refined arsenic trioxide during the fiscal year.

Cadmium.—Tsumeb Corp. processsed 4,143 tons of sinter baghouse dust, an 11-percent decrease from that of the previous fiscal year. The assay of refined cadmium produced continued at 99.98 percent pure.

Copper.—Concentrate production at Tsumeb and Kombat increased 8 percent. Production of blister copper, however, was 6 percent below that of the previous year. The flotation plant at Matchless was operated intermittently throughout the year as mine production did not reach the rated capacity of the mill (7,000 tons of concentrate per year).

The Oamites copper mine, located 55 kilometers south of Windhoek, a joint venture of Falconbridge South Africa Exploration Co., Ltd., a subsidiary of Falconbridge Nickel Mines, Ltd., Canada, and IDC, began production late in the year. The scheduled annual production rate is 600,000 tons of ore and 18,000 tons of concentrate, which will be railed to Tsumeb for smelting. Ore reserves, estimated at 5 million tons, are expecteed to increase as mining continues.[4]

Production of copper-lead concentrate at the Rosh Pinah zinc mine of Imcor Zinc (Pty.) Ltd., a subsidiary of the South African Iron and Steel Industrial Corp., Ltd. (ISCOR), continued at an annual rate of 15,000 tons. The concentrate was exported to the United Kingdom for smelting.

The mine and mill of Klein Aub Koper Maatskappy Beperk, administered by General Mining and Finance Corp., Ltd., operated at full capacity during the year. A total of 220,000 tons of ore was milled resulting in the production of 9,824 tons of concentrate. Profits, however, at $1,876,000, were $1,857,800 lower than the previous fiscal year due to lower prices for copper.

Prospecting continued east of Windhoek by Fedswa Prospkteerders (Pty) Ltd. at an ore body estimated to contain 8 million tons of ore with a copper content of 1.9 percent. Prospecting will be curtailed upon completion of feasibility studies and metallurgical testing in progress during the year.

Société Minière et Métallurgique de Peñarroya and Nord Resources Corp. announced the discovery of an ore body estimated at 1 million tons, containing 2.6 percent copper, on their jointly held property at Gorob. Further exploration and a feasibility study are planned for 1972.[5]

Lead and Zinc.—Production of concentrates and refined lead at Tsumeb Corp., Ltd., declined in fiscal 1971. Refined lead production decreased 16 percent from the fiscal 1970 output.

Total lead-zinc concentrate production at the Berg Aukas operation of SWACO declined to 39,190 tons in fiscal year 1971, compared with 50,876 tons produced in the previous fiscal year. The production of lead vanadate, however, increased 92 percent as a result of vanadium-rich ore on 14 level, No. 2 shaft. The decrease in production of zinc silicate concentrates of about 23 percent was a result of low-grade zinc ore mined from above 8 level at No. 1 shaft. Production statistics for the Berg Aukas mine and mill, for the fiscal year ending June 30, 1971, were as follows:

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[4] South African Digest. Copper Mine for SWA. Aug. 6, 1971, p. 11.

[5] Mining Journal. SWA Copper "Find." V. 277, No. 7108, Nov. 12, 1971, p. 437.

	Quantity (metric tons)	Grade (percent)		
		V_2O_5	Lead	Zinc
Ore mined	196,200	0.98	2.50	13.50
Ore milled	135,700	1.34	4.70	18.50
Concentrate production:				
Lead vanadates	8,197	17.29	43.10	16.50
Zinc sulfides	6,721	--	3.00	55.30
Lead sulfides	598	--	46.60	19.00
Zinc silicates	23,674	--	2.30	46.40

The Rosh Pinah mine of Imcor Zinc (Pty) Ltd., in which ISCOR holds the controlling interest, produced 37,636 tons of concentrate, yielding 20,488 tons of metal, during the fiscal year. An intensive prospecting program was undertaken in the vicinity of the mine to bring more ore into reserve.

Silver.—Production of silver by Tsumeb, mainly refined on toll, increased 16 percent during the fiscal year while sales decreased 8 percent. During the year, a total of 330,935 ounces of silver was produced at the Klein Aub copper mine and mill.

Tin-Tungsten.—SWACO mined 7 percent more ore at its Brandberg West open pit and produced 24 percent more concentrate than the previous year. The grade of ore was below expectations, and low-grade stockpile material was regularly used to supplement the plant feed. Production statistics for the Brandberg West operation, for the year ending June 30, 1971, were as follows:

	Quantity	Grade (percent)	
	(metric tons)	Tin	Wolfram
Tons loaded	1,185,000	--	--
Tons milled	111,000	0.23	0.17
Concentrate produced	595	33.15	20.23

The Uis tin mine of ISCOR produced 1,238 long tons of tin concentrate, containing 755 long tons of recoverable tin, or about 63 percent of ISCOR's tin requirements during the fiscal year. The concentrates were shipped to the Vanderbijlpark Works in the Republic of South Africa for smelting.

Uranium.—A pilot plant for testing uranium ores was under construction at the Rossing uranium project, located near Swakopmund, as development of the world's largest open pit uranium mine continued. Western Knapp Engineering Division, Arthur G. McKee & Co., San Francisco, Calif., and another unspecified company, were awarded the joint venture contract for design engineering, procurement, and construction of the mining and milling facilities.[6] Rossing Uranium, Ltd., comprised of Rio Tinto South Africa, Ltd., General Mining and Finance Corp., and IDC, is the operating and managing company of the project. Planned mill capacity is 5,000 tons of concentrate per year from 20,000 tons of ore mill feed per day.[7] The low-grade, high tonnage ore is to be processed by the South African Nuclear Fuel Corp. and the resulting concentrate is to be exported to the United Kingdom. Production is scheduled to begin in 1973, employing 700 Europeans and 1,000 Africans.

In November, the Department of Mines of South Africa offered Anglo American Corp. of South Africa, Ltd., leadership of a consortium to prospect for uranium in the Rossing area. De Beers Prospecting S.W.A. (Pty.) Ltd. was awarded a concession in the same area.

NONMETALS

Cement.—South-West Africa Portland Cement, Limited, proceeded with plans for constructing a cement factory at Karibib. Construction is scheduled to begin in the first half of 1972.

Diamond.—According to the 1971 Annual Report of CDM, operations continued at a reduced level with total output declining for the second consecutive year. In onshore Diamond Area No. 1, output increased slightly while the average stone size increased substantially. Production from the Western Block began during the year on a limited basis with stone size and grade higher than predicted, although the depth of sand overburden, close proximity to the sea, and depth of bedrock below sea level, presented major problems to mining. Construction of a boulder-conglomerate separation plant began with commissioning scheduled for late in 1972.

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[6] Skilling's Mining Review. New Uranium Project in South West Africa. V. 60, No. 52, Dec. 25, 1971, p. 28.

[7] Atomic Industrial Forum. Nuclear Industry. V. 18, No. 1, January 1971, p. 45.

Table 4.—South-West Africa: Operations of the Consolidated Diamond Mines of South-West Africa, Ltd.

Operation	Onshore		Foreshore		Offshore		Totals and averages	
	1970	1971	1970	1971	1970	1971	1970	1971
Overburden stripped thousand cubic meters	16,992	18,797	1,896	322	XX	XX	18,888	19,119
Deposits mined and treated do	5,704	6,133	446	95	13	41	6,163	6,269
Production carats	1,509,263	1,561,572	133,872	45,414	16,571	40,824	1,659,706	1,647,810
Grade carats per cubic meter of deposit treated	0.26	0.25	0.30	0.48	1.26	1.00	0.27	0.26
Average diamond size carats	.76	.88	.51	.50	.42	.41	.74	.86
Cost per cubic meter of deposit treated dollars	3.67	3.64	4.05	5.10	55.61	57.19	3.81	4.01
Cost per carat recovered do	13.86	14.29	13.52	10.65	44.16	57.00	14.14	15.04

XX Not applicable.

The entire foreshore and sea mining operations of CDM were suspended on April 15, 1971, and April 24, 1971, respectively. Mining in the foreshore area was discontinued as bedrock depth increased and average stone size decreased. Prospecting will continue in the foreshore area with the possibility of eventually mining further into the surfzone.[8] Mining in Chameis Bay was discontinued as actual grades mined were half of those anticipated. During the period beginning July 1, 1967, the date CDM began operations for its own account under terms of the lease agreement with Marine Diamond Corp., Ltd. (MDC), and ending in April 1971, when operations were discontinued, a total of 733,673 carats were recovered from these two mining areas.

The vessels *Pomona, Collinsea, Chameis,* and *Bellatrix* were sold during the year. The *Rockeater* and *Gemsbok* continued prospecting in the offshore area. The lease of prospecting and mining rights of MDC, was renewed until the end of 1972.

Fluorspar.—ISCOR considered resumption of mining at its Okuroso deposit, located near Otjiwarongo on the railroad linking Tsumeb and Walvis Bay.[9] The deposit is estimated to contain 5 million tons of ore averaging 50 percent CaF_2.

Bethlehem Steel Corp., in agreement with Tsumeb Corp., acquired exploration rights covering an extensive area between Outjo and Grootfontein, adjacent to the ISCOR property.[10]

Sulfuric Acid.—The plant at Tsumeb operated for 17 days, producing 151 tons to supply the requirements of its Tsumeb and Matchless operations and a small quantity of 9 tons to fill orders from customers.

MINERAL FUELS

Petroleum.—The Southern Oil Exploration Corp. (Pty.) Ltd. (SOEKOR), the South African Government agency, requested bids for substantial onshore and offshore acreage, with offers to be made for either outright exploration awards or participation agreements with existing lessees. The onshore tract included the area relinquished by Shell Exploration South Africa (Pty.) Ltd. and BP Development Co. of South Africa, Ltd., in 1970. During the year, Shell/BP retained interest in an offshore sublease northeast of Walvis Bay while Chevron Oil Co. of South-West Africa, Ltd., retained a 25-percent interest in a large tract off the southeastern coast. Etosha Petroleum Co. (Pty.) Ltd., controlled by the Canadian-based Brilund Mining Co. and Société Nationale des Petroles d'Aquitaine, in a joint venture with De Beers Consolidated Mines, Ltd., continued onshore exploration.[11] During the year, Etosha Petroleum announced the discovery of potential oil-bearing structures at its concession in the Etosha National Park.[12]

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[8] Engineering and Mining Journal. V. 172, No. 5, May 1971, p. 30.

[9] Industrial Minerals (London). No. 48, September 1971, p. 25.

[10] Industrial Minerals (London). No. 46, July 1971, p. 33.

[11] Petroleum Press Service. V. 38, No. 3, p. 100.

[12] South African Digest. Jan. 15, 1971, p. 4.

The Mineral Industry of Spain

By John D. Corrick [1]

In the wake of worldwide monetary realignments, inflation, and continued business recessions, the growth of the Spanish gross national product (GNP) slipped from 6.5 percent in 1970 to 4.9 percent in 1971. Spain's GNP had led the countries of Western Europe by averaging an annual growth rate of 7.4 percent since 1960. Decreased industrial activity was the principal reason for reduced growth in Spain's GNP during 1971. More specifically, rampant inflation coupled with slowdowns in western economies were the apparent reason for an inflationary trend of 10 percent, compared with about 6 percent for each year of the preceding decade. Fragmentation of Spanish industry, dominance of banks, and low level spending for technology compounded the problem of inflation. It was not until the last quarter of 1971 that business showed signs of improving. The Spanish Government was responsible in part for the increased activity, through the use of lower bank rates and other incentives to stimulate new investments, as well as projecting increased Government spending under the third Economic and Social Development Plan.

The third development plan, which had taken 10 years to formulate, was unveiled in the latter part of 1971. Since the first plan went into effect in the early 1960's, Spain's economy progressed rapidly. During the last decade, per capita income had more than doubled. The third plan called for expenditures of $12.8 billion, with 30 percent being provided by the Spanish Government and the remainder by private industry. Government investments in the plan included, among other things, $244 million for research and technical development and $517 million for fostering new industry and reorganizing current industries. The plan called for construction of a steel complex in Sagunto with a 6-million-ton-per-year capacity and an oil refinery at Tarragona with a capacity to process 11 million tons of crude petroleum per year. New sources of power were to be sought through the mining of uranium ore and production of enriched uranium. Two additional nuclear electrical generating centers at Almaraz and Lemóniz (1,800 megawatts each) were to be added to the existing three plants. These plants, coupled with construction of a fast nuclear reactor, should permit Spain to compete internationally in the field of nuclear power.

The national program, Accion Concertada, to develop Spanish mineral resources fell short of its intended goals. A new expansion plan, Plan Nacional de la Mineria (PNM), for the mining and metallurgical industry was started early in 1971 by the Dirección General des Minas, a department within the Ministry of Industry. The PNM was to promote greater activity in the mining industry and expand development of mineral resources. Goals of the PNM were to encourage consolidation of concerns engaged in mineral extraction, modernization of mining techniques, revision of mining laws, improvement in conditions of work, and participation of the State in mining operations. A significant feature of PNM was to increase iron ore production to meet Spain's demands. Although the country has large reserves of iron ore, production had stabilized at approximately 7 million tons per year and Spain had to increase its imports of iron ore to meet spiraling demands. In order to alleviate this situation, the PNM provided for increasing iron ore production to approximately 13 million tons per year and for the installation of a pelletizing plant.

The value of Spain's crude mineral production in 1971 exceeded that of 1970 by approximately 4 percent. However, mineral production failed to keep pace with Spain's demand. The balance of trade in ore and metals in 1971 showed a deficit of $446.2 million compared with $673.5 million in 1970. The 1971 trade deficit was caused by increased imports which were necessitated by insufficient domestic production. Principal factors affecting production were outdated equipment, a large number of small marginal companies, and inadequate investments.

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[1] Physical scientist, Division of Ferrous Metals.

Foreign investments were the bright spot in Spain's economy in 1971. Investments increased to an alltime high of $139.0 million in 1971, an increase of 12.7 percent over that of 1970. These investments included only those companies which were controlled by foreign concerns. Foreign investment in Spanish companies more than doubled between 1962 and 1971. Between 1960 and the end of 1971, foreign investments totaled approximately $968.8 million. The four nations investing the largest amounts of money during this period were the United States with $299.3 million, Switzerland with $208.4 million, Federal Republic of Germany with $119.6 million, and France with $72.1 million.

PRODUCTION

During 1971, significant gains were made in the mine output of copper ore (195 percent) and blister copper (77 percent), antimony ore (43 percent), manganese ore and concentrate (69 percent), mercury ore (48 percent), primary tin metal (61 percent), and acid grade fluorspar (23 percent). Significant decreases occurred during 1971 in the production of refined copper (12 percent), ilmenite (13 percent), zinc ore and concentrate (10 percent), pyrite (11 percent), and crude petroleum (40 percent).

Table 1.—Spain: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971[p]
METALS			
Aluminum:			
Bauxite	4,752	5,013	[e] 5,000
Metal, primary	[r] 106,351	115,146	126,647
Antimony:			
Mine output, metal content	[r] 121	79	113
Metal (regulus)	849	NA	NA
Arsenic, white	[r] 92	17	--
Bismuth, mine output, metal content ... kilograms	12,147	12,450	[e] 12,000
Cadmium metal	80	111	120
Copper:			
Mine output, metal content	10,547	9,522	28,129
Metal:			
Blister	[r] 54,254	39,825	70,547
Refined:			
Electrolytic	[r] 74,696	82,802	73,245
Fire refined	[r] 4,124		
Iron and steel:			
Iron ore and concentrate ... thousand tons	6,409	7,051	7,308
Pig iron ... do	3,333	4,164	4,825
Electric furnace ferroalloys ... do	95	112	130
Crude steel ... do	6,005	7,429	7,794
Semimanufactures ... do	5,117	5,633	[1] 5,551
Lead:			
Mine output, metal content	71,749	72,715	69,502
Metal, primary	[r] 78,391	68,682	72,146
Manganese ore and concentrate	23,382	10,678	18,006
Mercury:			
Mine output, metal content ... 76-pound flasks	64,862	45,543	67,528
Metal ... do	[r] 64,531	44,736	48,843
Silver, metal ... thousand troy ounces	1,823	[e] 1,640	[e] 1,640
Tin:			
Mine output, metal content ... long tons	261	436	170
Metal:			
Primary ... do	[r] 3,859	2,943	4,751
Secondary ... do	[r] 575	615	[e] 650
Titanium:			
Ilmenite concentrates	29,232	27,129	23,617
Dioxide	12,958	16,021	16,334
Tungsten, mine output, metal content	[r] 201	408	272
Uranium, mine output, U_3O_8 content	103	84	148

See footnotes at end of table.

Table 1.—Spain: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971 [p]
METALS—Continued			
Zinc:			
Mine output, metal content	84,348	98,065	85,849
Metal, primary	[r] 81,275	89,202	89,309
NONMETALS			
Barite	63,621	84,567	[e] 85,000
Cement, hydraulic:			
Natural thousand tons	[e] 300	[e] 300	NA
Other do	16,013	16,536	16,993
Chalk cubic meters	93,119	93,420	NA
Clays:			
Bentonite	34,957	37,354	NA
Kaolin, marketable	274,314	174,054	[e] 175,000
Other thousand cubic meters	4,971	6,327	NA
Diatomite and tripoli	[r] 8,454	18,357	[e] 20,000
Earths, industrial, n.e.s	17,189	11,528	NA
Feldspar and pegmatite	43,735	55,084	[e] 56,000
Fertilizer materials:			
Crude potash salts, K_2O equivalent	635,648	598,319	604,484
Manufactured:			
Nitrogenous, nitrogen content thousand tons	463	511	439
Phosphatic, P_2O_5 content do	307	318	375
Potassic, K_2O equivalent do	551	[e] 530	555
Fluorspar:			
Gross weight:			
Acid grade	204,173	199,722	245,735
Metallurgical grade	101,341	141,943	154,139
Total	305,514	341,665	399,874
Calcium fluoride content:			
Acid grade	198,458	194,054	237,924
Metallurgical grade	52,158	66,627	70,328
Total	250,616	260,681	308,252
Gypsum and anhydrite, crude thousand tons	3,943	4,228	[e] 4,200
Lime (quicklime and hydrated lime) do	[r] 505	[e] 500	[e] 500
Magnesite, crude	229,080	222,445	[e] 225,000
Meerschaum (sepiolite), crude	17,538	31,589	NA
Mineral pigments, ocher	20,780	12,480	NA
Pumice	231,680	199,902	[e] 200,000
Pyrite including cupreous:			
Gross weight thousand tons	2,517	2,766	2,429
Sulfur content do	1,194	1,274	1,135
Salt:			
Rock do	1,076	1,126	[e] 1,100
Marine and other evaporated do	786	945	[e] 930
Sand and gravel:			
Sand:			
Silica sand thousand cubic meters	774	538	NA
Other do	955	4,686	NA
Gravel do	2,148		
Stone:			
Calcareous:			
Dolomite do	270	394	NA
Limestone do	25,525	28,416	NA
Marble do	152	153	NA
Marl do	2,912	2,811	NA
Basalt do	1,622	1,407	NA
Diabase do	3	--	NA
Granite do	2,048	1,933	NA
Ophite do	163	170	NA
Phonolite do	153	236	NA
Porphyry do	70	47	NA
Quartz thousand tons	303	275	NA
Quartzite thousand cubic meters	439	523	NA
Sandstone do	626	568	NA
Serpentine do	13	16	NA
Slate do	83	96	NA
Trachyte do	61	89	NA
Trass and tufa do	136	207	NA
Strontium minerals	3,600	[e] 7,000	[e] 22,000
Sulfur, elemental, all forms	5,271	6,251	[e] 6,300
Sulfates, natural:			
Glauberite, Na_2SO_4 content	10,500	14,931	NA
Thenardite, Na_2SO_4 content	69,483	79,702	NA
Talc and steatite	33,728	39,612	[e] 40,000

See footnotes at end of table.

Table 1.—Spain: Production of mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity	1969	1970	1971 p
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural (contained)	1,854	1,871	NA
Carbon black	r 35,000	39,000	e 40,000
Coal:			
Anthracite ..... thousand tons	r 2,773	2,808	2,864
Bituminous ..... do	r 8,854	7,943	7,811
Lignite ..... do	2,740	2,831	3,064
Total ..... do	14,367	13,582	13,739
Coke:			
Metallurgical ..... do	3,686	4,029	4,066
Gashouse ..... do	r 16	9	8
Fuel briquets, all types ..... do	153	195	e 200
Gas, manufactured [2] ..... million cubic feet	25,064	NA	NA
Peat	11,200	16,338	e 17,000
Petroleum:			
Crude ..... thousand 42-gallon barrels	1,386	1,457	874
Refinery products:			
Gasoline, aviation ..... do	71	27	9
Gasoline, motor ..... do	25,932	27,846	29,536
Jet fuel ..... do	6,675	10,768	11,093
Kerosine ..... do	3,079	1,837	2,387
Distillate fuel oil ..... do	49,245	52,392	57,360
Residual fuel oil ..... do	93,881	104,256	103,243
Lubricants ..... do	1,391	1,869	1,500
Other ..... do	19,394	35,030	42,681
Refinery fuel and losses ..... do	10,882	4,439	11,861
Total ..... do	210,550	238,464	259,670

e Estimate. p Preliminary. r Revised. NA Not available.

[1] Partial figure, excludes 1) ingots for tubes, 2) wheels, tires, and axles, and 3) semimanufactures for sale, data for which are not available; in 1970, these classes totaled 205,000 tons.

[2] Excludes gas produced in iron and steel plants and petroleum refineries.

TRADE

Spain's trade deficit in mineral commodities was $1,132 million in 1971, compared with $1,185 million in 1970 and $989 million in 1969. Values for mineral commodity trade and total commodity trade for the past 3 years were as follows:

	Value (million dollars)	
	Mineral commodity trade	Total commodity trade
Exports:		
1969	289	1,900
1970	339	2,387
1971	388	2,938
Imports:		
1969	1,278	4,233
1970	1,524	4,747
1971	1,521	4,963

Source: Estadística del Comercio Exterior de España (Madrid), 1969, 1970, and 1971.

Exports of mineral commodities were valued at $388 million, an increase of 14 percent over those of 1970. Significant increases occurred in exports of steel and iron ore while decreases occurred in coal and petroleum products, copper, and mercury. Mineral fuels, valued at $125.8 million, accounted for approximately 32 percent of Spain's total mineral exports for 1971.

The value of mineral commodities imported during 1971 decreased 0.2 percent from that of 1970. Imports of coal, petroleum, iron and steel, and minerals and ores were responsible for a major portion of the $1,520.7 million value of mineral imports. Those imported mineral commodities that showed a significant decrease in 1971 were iron and steel, copper, and chemicals.

Mineral commodity trade in 1969 and 1970 is given in tables 2 and 3.

Table 2.—Spain: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum including alloys:			
Scrap	147	77	West Germany 77.
Unwrought	1,463	2,463	West Germany 2,227; Netherlands 75.
Semimanufactures	8,949	10,754	France 3,055; United States 2,590; United Kingdom 2,288.
Antimony including alloys, all forms	1	104	Netherlands 94; United States 10.
Cadmium including alloys, all forms	34	18	Netherlands 11; United Kingdom 3; Republic of South Africa 2.
Chromium oxide and hydroxide	2	19	United Kingdom 17.
Copper:			
Matte	348	682	Belgium-Luxembourg 662; United Kingdom 19.
Sulfate	251	380	Equatorial Guinea 380.
Metal, including alloys:			
Scrap	12	34	West Germany 20; Belgium-Luxembourg 11.
Unwrought	21,482	18,435	Netherlands 10,064; West Germany 3,496.
Semimanufactures	2,457	3,148	West Germany 1,018; Romania 439; Hungary 266.
Iron and steel:			
Iron ore except roasted pyrite thousand tons	1,676	2,037	West Germany 946; United Kingdom 563; France 440.
Roasted pyrite do	669	671	West Germany 532; United Kingdom 53.
Metal:			
Scrap	531	1,218	Netherlands 643; Belgium-Luxembourg 216.
Pig iron including cast iron	41,251	20,465	East Germany 10,245; Italy 5,428.
Ferroalloys	12,689	6,367	United Kingdom 3,730; West Germany 550; Ireland 500; East Germany 500.
Steel: primary forms	28,866	97,947	United States 49,834; France 46,962.
Semimanufactures:			
Bars, rods, angles, shapes and sections	80,370	101,476	West Germany 36,105; France 18,634; Portugal 5,758.
Universals, plates, and sheets	16,443	6,929	Argentina 3,943; France 1,108.
Hoop and strip	700	2,674	France 1,066; Portugal 992; Brazil 474.
Rails and accessories	80	--	
Wire	2,935	2,295	Portugal 975; Greece 414.
Tubes, pipes, and fittings	22,333	39,244	France 5,706; Morocco 5,596; Ecuador 5,297; United Kingdom 3,353.
Castings and forgings, rough	943	2,358	West Germany 458; Canada 422; United States 354.
Lead:			
Ore and concentrate	10	--	
Oxides	152	315	Italy 293.
Metals including alloys, all forms	617	929	West Germany 597; Angola 80; Netherlands 65; Belgium-Luxembourg 61.
Magnesium including alloys, all forms	7	113	Netherlands 59; United Kingdom 52.
Manganese oxide	5	--	
Mercury 76-pound flasks	41,946	43,280	West Germany 13,924; Japan 6,788; France 3,423.
Molybdenum including alloys, all forms kilograms	47	142	Netherlands 142.
Nickel:			
Metal, including alloys:			
Scrap	55	58	France 39.
Unwrought	65	94	Netherlands 70; West Germany 20.
Semimanufactures	35	47	Italy 27; Netherlands 7; Belgium-Luxembourg 5.
Silicon, elemental	(1)	1,516	Algeria 549; Morocco 499; Arab Republic of Egypt 452.
Tin:			
Metal including alloys:			
Scrap long tons	4	93	West Germany 93.
Unwrought do	607	1,494	Netherlands 334; Morocco 295; West Germany 226.
Semimanufactures do	2	1	Mainly to Cuba.
Titanium:			
Ore and concentrate (ilmenite)	3,500	1	Mainly to Austria.
Oxides	666	2,878	United States 2,246; United Kingdom 418.
Tungsten:			
Ore and concentrate	407	669	West Germany 374; United Kingdom 170.
Metal including alloys, all forms	10	20	Netherlands 9; France 6.
Zinc:			
Ore and concentrate	12,985	11,594	West Germany 5,624; Netherlands 2,534; Italy 1,800.
Oxide and peroxide	1,344	1,231	West Germany 395; Colombia 239; United States 150; Italy 140.

See footnotes at end of table.

Table 2.—Spain: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS—Continued			
Zinc—Continued			
Metal including alloys, all forms	6;975	3,929	United Kingdom 900; Portugal 893; Morocco 648.
Other:			
Ore and concentrate	33	36	United States 30; United Kingdom 6.
Ash and residues containing nonferrous metals	33,929	14,828	Finland 7,180; Belgium 3,229; Netherlands 2,817.
Oxides, hydroxides and peroxides of metals, n.e.s	[r] 299	541	France 384; Netherlands 77.
Metal, including alloys, all forms	7	15	Netherlands 12.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural, corundum, etc	1,738	822	West Germany 714; United Kingdom 76.
Grinding and polishing wheels and stones	1,084	1,396	West Germany 460; France 280; Poland 121.
Barite and witherite	41,624	48,458	West Germany 20,807; United Kingdom 17,215.
Cement	89,297	170,522	Algeria 29,722; Brazil 27,695; Italy 17,925; Equitorial Guinea 14,229.
Chalk	42	1	Mainly to United Kingdom and France.
Clays and products:			
Crude n.e.s.:			
Bentonite	5,765	5,046	Sweden 2,250; Netherlands 1,214; West Germany 600.
Kaolin (china)	[r] 33,004	40,218	West Germany 21,325; Italy 7,648.
Other	[r] 37,560	29,036	Italy 9,536; West Germany 6,554; Andorra 5,361.
Products:			
Refractory (including nonclay bricks)	4,408	5,377	Cuba 2,276; Dominican Republic 730; Belgium-Luxembourg 548.
Nonrefractory	35,885	67,699	France 15,169; Andorra 10,369; Hungary 4,954; Morocco 3,080.
Diamond, industrial value, thousands	[r] $16	$4	Mainly to Mexico.
Diatomite and other infusorial earths	1,402	1,741	France 367; Algeria 365; West Germany 322; United Kingdom 215.
Feldspar	1,021	45	Ecuador 30; France 15.
Fertilizer materials:			
Crude:			
Nitrogenous	2	--	
Potassic	514,346	443,438	Poland 102,712; Norway 94,249; United Kingdom 62,785.
Manufactured:			
Nitrogenous	911	96	Andorra 96.
Phosphatic	69,811	91,064	Algeria 79,878; France 5,529; Cuba 5,000.
Potassic	21,570	29,518	Algeria 12,950; Portugal 5,425; Greece 5,260.
Other, including mixed	3,338	1,297	Belgium-Luxembourg 600; Equatorial Guinea 600.
Ammonia	89	10	Mauritania 4; Equatorial Guinea 1.
Fluorspar	201,949	170,431	United States 120,851; West Germany 37,134.
Gypsum and plasters	15,446	4,136	Andorra 3,184; Republic of South Africa 380.
Lime	6,468	5,411	Equatorial Guinea 4,898; Cuba 66.
Magnesite	36,364	54,325	United Kingdom 31,153; West Germany 21,442.
Mica, all forms	101	89	West Germany 23; Turkey 14; Italy 13; Colombia 12.
Pigments, minerals including processed iron oxides	17,633	14,079	United Kingdom 2,135; United States 1,725; Australia 1,509; Italy 1,242.
Precious and semiprecious stones, except diamond:			
Natural value, thousands	[r] $11	$3	United States $2.
Manufactured do	$86	$26	France $15; Switzerland $3; Italy $2.
Pyrite (gross weight) thousand tons	1,024	885	West Germany 511; Belgium-Luxembourg 135.
Salt and brine do	273	179	Norway 37; Canada 25; Iceland 25; Sweden 22.
Sodium and potassium compounds, n.e.s	3,614	6,593	Brazil 4,000; Finland 2,000.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Marble and other calcareous	15,143	17,754	Italy 12,403; West Germany 1,823; France 1,434.

See footnotes at end of table.

Table 2.—Spain: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
NONMETALS—Continued			
Stone, sand and gravel—Continued			
Dimension stone—Continued			
Crude and partly worked—Continued			
Slate	72	89	France 45; Andorra 44.
Other	15,398	20,070	France 13,227; Italy 6,358.
Worked:			
Slate	37,272	31,418	France 29,146.
Paving and flagstone	66	373	France 320; Italy 21.
Other	12,202	12,408	West Germany 10,163; France 1,044.
Dolomite, chiefly refractory grade	17,086	19,933	United Kingdom 16,258; West Germany 1,520; Morocco 800.
Gravel and crushed rock	1,956	2,643	West Germany 889; Algeria 791.
Quartz and quartzite	71,178	92,705	Norway 82,316; Sweden 8,234.
Sand	15,153	18,354	Andorra 17,654.
Sulfur:			
Elemental, all forms	358	530	Morocco 449.
Sulfur dioxide	16	1,069	Algeria 495; Italy 336; Portugal 238.
Sulfuric acid	10,152	5	Mainly to Equatorial Guinea.
Talc, soapstone and pyrophyllite	9	130	Italy 60; France 40.
Other nonmetals, n.e.s.:			
Crude	18,198	17,060	United Kingdom 6,524; France 3,626; West Germany 3,553.
Slag, dross and similar waste, not metal bearing	26,995	1	Mainly to France.
Oxides and hydroxides of magnesium, strontium, and barium	35	65	Republic of South Africa 60.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black and gas carbon	5,436	8,570	United Kingdom 5,116; Poland 600; Morocco 540.
Coal, coke and briquets:			
Anthracite	18	203,736	West Germany 146,701; Netherlands 16,761; Italy 15,528; Hungary 14,786.
Bituminous	7,726	374,443	Netherlands 126,412; Portugal 108,944; West Germany 85,731.
Coal briquets	7,744	9,734	West Germany 9,720.
Lignite and lignite briquets	937	772	Andorra 737.
Coke and semicoke	466,016	254,889	Romania 92,169; West Germany 35,243; Bulgaria 22,017.
Hydrogen, helium and rare gases	(1)	28	Portugal 22.
Peat, including briquets and litter	48	40	Italy 40.
Petroleum:			
Refinery products:			
Gasoline (including natural) thousand 42-gallon barrels	8,500	6,837	United Kingdom 2,165; Canada 1,391; United States 906.
Kerosine and jet fuel do	2,687	1,053	Portugal 342; Sweden 225; France 156; Netherlands 136.
Distillate fuel oil do	7,945	13,402	Netherlands 3,942; Denmark 2,140; Sweden 1,327; United Kingdom 1,061.
Residual fuel oil do	20,433	17,883	United States 7,566; United Kingdom 1,431; Italy 1,276.
Liquefied petroleum gas do	320	673	Portugal 306; France 90.
Lubricants do	98	175	Arab Republic of Egypt 160.
Mineral jelly and wax do	5	3	Mainly to United Kingdom.
Other do	524	634	Portugal 218; Zaire (formerly Congo-Kinshasa) 70; Cyprus 67.
Mineral tar and other petroleum-, or gas-derived crude chemicals	2,589	3,390	France 3,170.

[r] Revised.
[1] Less than ½ unit.

Table 3.—Spain: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum:			
Bauxite and concentrate	93,610	155,181	Greece 43,820; Guyana 32,200; Surinam 27,087.
Oxide and hydroxide	215,138	1,385,279	Guinea 606,733; France 365,035; Guyana 164,319.
Metals including alloys:			
Scrap	111	4	Andorra 2.
Unwrought	26,589	13,877	Canada 9,735; Poland 1,066.
Semimanufactures	6,318	5,720	West Germany 1,499; France 867; Sweden 773; Switzerland 672.

Table 3.—Spain: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS—Continued			
Antimony:			
Ore and concentrate	669	432	Morocco 250; Bolivia 32.
Metal, including alloys, all forms	194	245	United Kingdom 105; Italy 67.
Arsenic:			
Trioxide, pentoxide, and acids	487	425	France 396.
Metal including alloys, all forms	4	9	Sweden 9.
Bismuth including alloys, all forms	35	31	United Kingdom 9; Belgium-Luxembourg 9; Netherlands 4.
Cadmium including alloys, all forms	10	6	Netherlands 2; United Kingdom 1; Belgium-Luxembourg 1.
Chromium:			
Chromite	45,381	58,911	Republic of South Africa 46,921; Philippines 3,526.
Oxide and hydroxide	78	145	Poland 91; West Germany 51.
Metal including alloys, all forms	11	18	United Kingdom 16.
Cobalt oxides and hydroxides	74	65	Belgium-Luxembourg 45; Canada 16.
Copper:			
Ore and concentrate	65,677	72,433	Cyprus 17,550; United States 17,472.
Matte	23,325	16,609	Canada 4,776; United States 3,174; France 3,009.
Sulfate	2,650	161	Belgium-Luxembourg 104; Czechoslovakia 35.
Metal including alloys:			
Scrap	19,697	16,609	Canada 4,776; United States 3,174; France 3,009.
Unwrought	48,754	55,379	Zambia 14,457; Chile 10,782; Belgium-Luxembourg 9,118.
Semimanufactures	6,632	7,179	France 1,676; West Germany 1,658; United Kingdom 1,355.
Iron and steel:			
Ore and concentrate, except roasted pyrite thousand tons	979	2,431	Brazil 1,217; Mauritania 480; Canada 258.
Roasted pyrite do	21	21	Mainly from Mauritania.
Metal:			
Scrap do	1,237	1,364	United States 1,100; United Kingdom 119; Canada 57.
Pig iron, spiegeleisen and other do	44	66	Algeria 31; Finland 15.
Ferroalloys do	16	16	Republic of South Africa 6; West Germany 2; France 1; United Kingdom 1.
Steel, primary forms do	929	836	United States 160; West Germany 47; Romania 33; Japan 19.
Semimanufactures:			
Bars, rods, angles, shapes and sections do	158	147	Brazil 33; West Germany 30; United Kingdom 20.
Universals, plates and sheets do	619	855	Japan 264; United States 115; United Kingdom 91; Belgium-Luxembourg 78.
Hoop and strip do	33	32	West Germany 9; France 5; Belgium-Luxembourg 5.
Rails and accessories do	12	3	United Kingdom 1; France 1.
Wire do	9	11	West Germany 3; France 3; Sweden 1; Belgium-Luxembourg 1.
Tubes, pipes, and fittings do	42	1	Mainly from France.
Lead:			
Ore and concentrate	1	5	Italy 5.
Oxides	22	7	United Kingdom 5.
Metal including alloys:			
Scrap	52	10	Andorra 9.
Unwrought	63	5	United States 2; U.S.S.R. 2.
Semimanufactures	87	83	West Germany 47; Netherlands 9.
Magnesium, including alloys, all forms	721	622	United States 496; Norway 44.
Manganese:			
Ore and concentrate	142,078	200,350	Australia 66,289; Ghana 47,095; Brazil 41,264.
Oxides	451	743	Japan 398; United States 159; Netherlands 152.
Metal including alloys	223	344	Republic of South Africa 200; France 126.
Mercury 76-pound flasks	5	4	West Germany 2; Austria 1.
Molybdenum including alloys, all forms	11	15	Austria 5; United Kingdom 4; Netherlands 3.
Nickel:			
Ore and concentrate	--	2	United States 2.
Matte and speiss and similar materials	489	355	Canada 172; Cuba 92.

See footnotes at end of table.

Table 3.—Spain: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS—Continued			
Nickel—Continued			
Metal, including alloys:			
Scrap	58	48	France 16; Canada 12; United States 11.
Unwrought	2,073	2,567	Canada 786; United Kingdom 678.
Semimanufactures	1,728	1,445	France 548; Italy 155; Switzerland 105.
Platinum–group metals:			
Waste and sweepings, including those of silver	361	75	United States 75.
Metal including alloys, all forms troy ounces	69,665	37,231	France 19,130; United Kingdom 13,793.
Rare–earth metals:			
Oxides	66	96	France 45; United States 27; United Kingdom 16.
Metal including alloys	6	(1)	NA.
Selenium, elemental	9	6	West Germany 2; Canada 1; United States 1.
Silicon, elemental	2,765	4,262	France 1,705; Yugoslavia 1,086; Switzerland 870.
Silver metal including alloys thousand troy ounces	3,729	2,797	United Kingdom 739; France 611; West Germany 547.
Tellurium, elemental	3	4	Canada 4.
Tin:			
Ore and concentrate long tons	4,949	5,450	Australia 1,996; Zaire (formerly Congo–Kinshasa) 1,117; France 420.
Oxides do	164	122	United Kingdom 103.
Metal including alloys, all forms do	108	101	United Kingdom 50; West Germany 26.
Titanium:			
Ore and concentrate	2,213	12,648	Norway 12,576.
Oxides	8,196	6,606	West Germany 2,304; United Kingdom 2,284.
Tungsten:			
Ore and concentrate	--	41	Australia 41.
Metal including alloys, all forms	9	9	Austria 2; Netherlands 2; West Germany 1; France 1.
Zinc:			
Ore and concentrate	12,672	9,158	Iran 4,275; Canada 2,100.
Oxide and peroxide	234	279	West Germany 260.
Metal including alloys, all forms	1,137	494	Peru 299; Netherlands 119.
Zirconium including alloys, all forms kilograms	215	1,000	United States 381; France 87.
Other:			
Ore and concentrates	21,536	11,836	Australia 11,413.
Ashes and residues containing nonferrous metals	11,448	13,602	United States 2,671; United Kingdom 2,609; France 1,781.
Oxides, hydroxides and peroxides of metals, n.e.s	965	1,032	West Germany 431; France 257.
Metal including alloys, all forms:			
Alkali, alkaline earth, and rare-earth metals	168	2	United Kingdom 1.
Pyrophoric alloys	4	6	West Germany 2.
Other base metals including alloys, all forms	229	144	Belgium-Luxembourg 91; West Germany 18.
NONMETALS			
Abrasive, n.e.s.:			
Pumice, emery, natural corundum, etc	1,073	1,964	Greece 1,551; United States 159.
Dust and powder of precious and semiprecious stones value, thousands	$89	$86	Netherlands $49; United Kingdom $21.
Grinding and polishing wheels and stones	811	822	West Germany 212; Italy 170; Austria 134.
Asbestos	85,446	77,772	Canada 30,390.
Barite and witherite	947	918	France 688; West Germany 210.
Boron materials:			
Crude natural borates	26,365	27,828	United States 21,175; Turkey 6,109.
Oxide and acid	1,448	636	France 275; United States 220.
Cement	405,856	300,635	France 116,602; United Kingdom 106,715.
Chalk	7,818	11,583	France 7,725; Belgium-Luxembourg 1,561; United Kingdom 1,135.
Clays and products:			
Crude n.e.s.:			
Bentonite	19,094	21,147	Morocco 8,309; Italy 5,614.

See footnotes at end of table.

Table 3.—Spain: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
NONMETALS—Continued			
Clays and products—Continued			
Crude n.e.s.—Continued			
Kaolin (china)	[r] 65,007	77,022	United Kingdom 62,726; United States 9,961.
Other	[r] 33,883	37,855	United Kingdom 27,036; France 6,138.
Products:			
Refractory (including nonclay bricks)	24,895	17,358	Austria 4,745; West Germany 2,302; United Kingdom 1,530.
Nonrefractory	11,849	9,060	Italy 5,493; Portugal 820.
Cryolite and chiolite	1,962	971	Denmark 970.
Diamond:			
Gem, not set or strung value, thousands	$3,053	$321	Belgium-Luxembourg $242.
Industrial do	$663	$1,333	Belgium-Luxembourg $685; Republic of South Africa $173.
Diatomite and other infusorial earths	5,910	4,137	United States 1,148; Algeria 1,039.
Feldspar	2,356	3,830	France 917; Norway 818; Republic of South Africa 736.
Fertilizer materials:			
Crude:			
Nitrogenous	158,555	156,548	Chile 75,607; Norway 53,112.
Phosphatic	[r] 1,343,335	1,402,288	Morocco 1,200,118; United States 171,164.
Potassic	9	17	Cameroon 10; France 5.
Manufactured:			
Nitrogenous	196,431	156,548	Chile 75,607; Norway 53,112.
Phosphatic:			
Thomas (basic) slag	29,959	20,702	Belgium-Luxembourg 19,007.
Other	[r] 65,510	40,263	Israel 10,863; Mexico 9,790; France 9,016.
Potassic	494	1,563	West Germany 1,563.
Other including mixed	276,741	118,180	United States 55,662; Belgium-Luxembourg 13,335.
Fluorspar	4	1,195	France 1,195.
Graphite, natural	885	1,263	Malagasy Republic 371; West Germany 319.
Gypsum and plasters	1,109	1,246	Morocco 516; West Germany 505.
Iodine	36	34	Japan 19; Chile 15.
Lime	4,492	2,480	United Kingdom 1,706; Portugal 416.
Magnesite	23,503	35,878	Greece 10,701; Austria 4,507; United Kingdom 4,221.
Mica, all forms	1,218	1,088	Norway 339; United Kingdom 175; India 151.
Pigments, mineral including processed iron oxides	2,531	2,377	West Germany 1,691; France 291; United Kingdom 282.
Precious and semiprecious stones, except diamond:			
Natural value, thousands	$623	$2,272	Belgium-Luxembourg $1,194; India $315.
Manufactured do	$413	$521	Switzerland $293; France $72.
Pyrite (gross weight)	101	81	Italy 64.
Salt and brine	1,817	1,388	Netherlands 876; United Kingdom 467.
Sodium and potassium compounds, n.e.s.	14,502	27,035	France 10,860; Netherlands 5,433.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Marble and other calcareous	27,679	26,192	Italy 14,529; Portugal 7,008.
Slate	447	155	Andorra 120; France 22.
Other	8,532	9,026	Norway 4,193; Sweden 1,489.
Worked:			
Slate	598	710	Italy 694.
Paving and flagstone	132	161	Italy 81; Belgium-Luxembourg 46.
Other	2,123	1,591	Portugal 769; Norway 369.
Dolomite, chiefly refractory grade	2,315	4,012	Belgium-Luxembourg 1,952; France 1,374.
Gravel and crushed rock	17,378	18,746	Morocco 16,414.
Quartz and quartzite	704	1,837	Sweden 1,374.
Sand excluding metal bearing	66,888	63,816	Belgium-Luxembourg 27,306; Ceuta 18,270.
Sulfur:			
Elemental, all forms	75,682	67,592	France 44,129; Poland 13,245.
Sulfur dioxide	153	119	Netherlands 119.
Sulfuric acid	22,034	18,053	Portugal 10,722; Italy 3,639; Netherlands 3,600.
Talc, steatite, soapstone and pyrophyllite	3,727	5,001	France 2,250; Norway 1,458; India 561.
Other nonmetals, n.e.s.:			
Crude	71,990	83,604	United States 21,347; France 10,756; Greece 8,298.
Slag, dross and similar waste, not metal bearing	680	3,181	West Germany 2,910.

See footnotes at end of table.

Table 3.—Spain: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
NONMETALS—Continued			
Other nonmetals, n.e.s.—Continued			
Oxide and hydroxides of magnesium, strontium, and barium	618	1,921	Japan 1,300; United States 162.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	826	750	United States 605; United Kingdom 124.
Carbon black and gas carbon	17,209	17,868	France 6,162; United Kingdom 5,162; Netherlands 3,497.
Coal and briquets:			
Anthracite thousand tons	30	14	Mainly from Republic of South Africa.
Bituminous do	2,216	3,450	United States 2,810; Poland 435; West Germany 143.
Coal briquets	17	27	Netherlands 20; United Kingdom 7.
Lignite and lignite briquets	17,942	25,968	France 25,961.
Coke and semicoke thousand tons	111	159	United States 83; Italy 25; France 19.
Hydrogen, helium and rare gases	400	499	France 408; United Kingdom 54.
Peat, including peat briquets	2,863	2,037	Ireland 494; Finland 441; United Kingdom 259.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	202,960	225,128	Libya 53,811; Saudi Arabia 48,518.
Refinery products:			
Gasoline (including natural) do	406	458	Surinam 241; Netherlands 100; United Kingdom 89.
Kerosine and jet fuel do	r 348	7	Mainly from Belgium-Luxembourg.
Distillate fuel oil do	163	15	Mainly from Italy.
Residual fuel oil do	484	633	Italy 257; Netherlands 142; United Kingdom 135.
Liquefied petroleum gas do	8,109	4,098	France 1,848; Netherlands 573; Algeria 510.
Lubricants do	320	356	United States 142; United Kingdom 50.
Other do	1,352	1,306	United States 1,007; Surinam 62.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals thousand tons	106	142	United States 106.

r Revised. NA Not available.

[1] Less than ½ unit.

COMMODITY REVIEW

METALS

Aluminum.—The Spanish aluminum industry in 1971 was comprised of two main groups of primary producers and semifabricators, namely Empresa Nacional del Aluminio, S.A. (ENDASA), associated with Aluminium Co. of Canada, Ltd. (ALCAN), and Aluminio de Galicia, S.A. (ALUMIGASA), associated with the Péchiney group of France. ENDASA and ALUMIGASA produced a total of 126,647 tons of aluminum in 1971, a 10-percent increase over that produced during a similar period of 1970. However, Spain's slow economic growth and its subsequent effect on sales during the year led to a substantial increase in producer stocks.

Although Spain was interested in expanding its aluminum industry, the country experienced difficulty because of its inability to integrate the industry backwards. Principal reason for this difficulty was that Spain lacked sizable bauxite reserves. Spanish resources of bauxite were estimated at 6 to 7 million tons. However, the silicon content was too high to permit economic utilization of these resources. The country's reserves were located in the Provinces of Lérida, Barcelona, Tarragona, Teruel, and Castellón. Spain's most significant deposit was in the Beceite-Fuentespalda region (Teruel). It contains about 100 million tons of ore grading 36 percent Al_2O_3. However, numerous technical and economic problems would have to be resolved before the deposit could be economically exploited. The Ministry of Industry approved bauxite prospecting programs in the La Solana, San Carlos del Valle, Valdepeñas, Montiel, and Membrilla regions of Ciudad Real Province.

During 1971, the president of the State's Instituto Nacional de Industria (INI) discussed with officials of ALCAN the possibility of establishing an alumina plant in Spain. Although plans were tentative, the likely location would be at Avilés where ENDASA had a smelter. The PNM called for a study to be made on the feasibility of building an alumina plant on the Tarragona coast with an annual capacity of over 200,000 tons using domestic and imported bauxite.

Installed primary aluminum capacity during 1971 was reported at 132,000 tons. Consumption was 126,000 tons, a 3-percent decrease from 1970. Primary aluminum stocks were reported at 11,000 tons, up considerably from the 1,200 tons reported in 1970. Imports were down slightly, while exports increased almost 2.5 times over those of 1970. During the year, ALUMIGASA requested three French companies to make a study for modification and expansion of the Spanish company's primary smelter at La Coruña. ALUMIGASA also planned to increase the aluminum extruding capacity of its Amorebieta (Vizcaya) plant. During the year, a fire destroyed the powerplant supplying ENDASA's primary aluminum smelter at Valladolid resulting in a 3-month loss of production. The company relied on stocks to supply customers until repairs were made.

Antimony.—Mine production of antimony in Spain over the past 3 years was reported at 121 tons in 1969, 79 tons in 1970, and 113 tons in 1971. Production came from two mines in Badajoz Province. The PNM predicted a modest increase in antimony production over the next decade. Stibnite production between 1972 and 1980 was to increase from 605 to 685 tons, with an additional 200 tons produced as a byproduct of lead production.

Copper.—Production of refined copper amounted to 73,245 tons in 1971, a 12-percent decrease from 1970. Mine production and output of blister copper increased 195 and 77 percent, respectively, over that produced in 1970. The principal reason for the increase was the startup of the Cerro Colorado copper pit and the continued high-level performance of the 45,000-annual-ton-capacity copper smelter at Huelva.

Rio Tinto-Patiño (RTP), which was formed by Compañia Española de Minas de Rio Tinto S.A. (55 percent); the Patiño Mining Corp. (40 percent); and Rio Tinto-Zinc Corp. (5 percent) continued stripping operations at its Cerro Colorado open pit operation ahead of schedule. Two 5,000-ton-per-day flotation circuits were given final shakedown tests in 1971. The 4,500-ton-per-day cyanide plant to treat gold and silver bearing gossan was scheduled for operation by yearend. Recent estimates placed Cerro Colorado ore reserves at 39 million tons, assaying 0.80 percent copper, and 18 million tons of gossan, assaying 0.07 ounce of gold and 5.0 ounces of silver per ton. RTP's new copper smelter and electrolytic refinery had been operational for approximately 1½ years. The smelter treated concentrates from Spain, Chile, Ireland, and Canada and crude ore from Spain and the United States. The smelter, one of the world's most modern, reportedly was producing about 200,000 tons of sulfuric acid per year. The acid recovery unit was capable of retaining 84 to 86 percent of the total sulfur contained in a single charge of the Momoda furnace. The research staff of RTP was conducting studies on pelletizing cement copper, flue dust and concentrate, for direct charging to the converters.

RTP confirmed that copper ore reserves at Arenteiro and Fornas, near Santiago de Compostela, in northwest Spain totaled approximately 11 million tons, averaging slightly more than 1.0 percent copper. Knapp Engineering, Division of Arthur G. McKee and Co., reviewed the geology and drilling data prior to financing. Open pit stripping began at the end of 1971. Planned output was 10,000 tons of copper per year. The ore was to be concentrated at the mine with the concentrate shipped to the Rio Tinto smelter at Huelva. Cost of the project was estimated at $14 million. RTP signed an agreement with Nippon Mining for technical cooperation and use of Nippon's copper electrorefining process at the Huelva refinery. Designed capacity of the refinery was 75,000 tons per year.

Unión Española de Explosivos S.A., which owns the old Compañia Española de Minas de Rio Tinto S.A., accelerated stripping at its Corta Atalaya copper-pyrite open pit mine. The company also prepared to sink a deep mining shaft below the pit and had commissioned a new 1.2-million-ton-per-year fine crushing plant.

Gold.—Spanish subsidiary of Imebesa, S.A., Northgate Exploration, Ltd., announced details of diamond drill hole prospecting for gold in northern Spain. During 1971, Northgate reported 10 holes were drilled and that eight of the 10 apparently intersected significant gold mineralization. The drilling tested a strike length of about 985 feet and outlined a mineralized intrusive zone 300 to 400 feet along the strike. The company dispatched additional rigs to speed evaluation. Assays from the drilling program ranged from 0.12 to 0.54 ounce of gold per ton.

Iron Ore.—Iron ore production in Spain was principally in Granada and Vizcaya Provinces. Companies operating in these regions and accounting for about 80 percent of Spain's iron ore output were Cia. Andaluza de Minas, Agrupacion Minera, S.A., Cia. Minera de Sierra Menera, Minero-Siderúrgica de Ponferrada, S.A., Española de Minas de Somorrastro, Minera del Andevalo, and Coto Minero "Vivaldi" y Anexas, S.A. Output of iron ore in 1971 was 7,307,577 tons (3,566,553 tons iron content), compared with 7,051,000 tons (3,452,736 tons iron content) in 1970. Production amounted to 97 percent of the targeted figure of 7,540,000 tons (3,864,000 tons iron content) called for by the PNM. Iron ore reserves were estimated at 676 million tons in 1971. En Adaro, a member of INI, conducted studies on processing carbonate ore from reserves in the Vizcaya region during the year.

Spanish mines improved extraction techniques partly as a result of new crushing and sorting equipment. The end result was an increased output of salable iron ore as noted by the growth (15 percent) of exports during 1971. Iron ore exports during 1971 amounted to 2.35 million tons, compared with 2.04 million tons during 1970. Main destinations were West Germany (887,221 tons), the United Kingdom (653,859 tons), and France (549,817 tons). However, continued consumer demand for iron and steel products resulted in Spain increasing imports of iron ore by about 34 percent during 1971, reaching 3.25 million tons as compared with 2.43 million tons in 1970. Principal sources of supply were Brazil (1,347,458 tons), Mauritania (706,650 tons), Canada (568,195 tons), and Liberia (301,796 tons). Spain ceased purchases of iron ore from Morocco's Seferif (Rif) mine. Spanish steelworks, which imported Rif material in the past, switched to higher grade ore and pellets. Morocco may regain some Spanish trade once Rif's pellet facilities become operational.

Sierra Menera invested heavily the past 3 years to raise iron ore production while attempting to remain competitive in both price and quality. The company looked favorably on the planned Saguno integrated steelworks, which was linked by rail with its Ojos Negros (Teruel) deposits. Present capacity of Sierra Menera was estimated at 750,000 tons per year of iron ore with an increase in quality. A pellet plant was to be installed by 1973 under the PNM's program for developing iron ore mines. The plant ultimately will produce 400,000 tons per year of sintered fines and 300,000 tons per year of 60–percent iron pellets.

The sinter plant at the Veriña works of Unión Siderúrgicas Españolas S.A. (UNINSA) started operations in 1971. The plant's designed capacity was reported to be 500,000 tons per year. A 2-million-ton-per-year addition was planned for operation in 1972, considerably increasing the UNINSA's capability to use Spanish iron ore.

Minero-Siderúrgica de Ponferrada signed a 3-year export contract with West Germany in 1971. The company experienced some difficulty in 1971 in hiring skilled workers which slowed the company's expansion program.

Officials of Spain and Algeria held discussions during the year on development of a joint mining operation at the Gara Djebilet iron ore deposit in Algeria. Spain would be responsible for building a railway from the mine to the Spanish Sahara coast or a connecting railway to the new phosphate ore loading pier at El Aaiun (see Fertilizer Materials section).

Iron and Steel.—A slowdown in Spanish industrial expansion during 1971 had a depressing effect on the country's steel industry. For the first time since 1959–60, Spanish steel production exceeded apparent consumption. Open hearths accounted for 20.8 percent of the raw steel output in 1971 compared with 26.4 percent in 1970; electric furnaces 36 percent compared with 35.2 percent in 1970; and Linz-Donawitz (LD) 43.2 percent compared with 38.4 percent in 1970. Apparent consumption of steel in 1971 was reported as 7.86 million tons, down 680,000 tons or 8 percent from 1970. Per capita consumption amounted to 230 kilograms compared with 258 kilograms in 1970 and 259 kilograms in 1969. Yearend steel industry stocks were estimated at 57,000 tons of finished and

278,000 tons of semimanufactured products. Output of iron and steel in Spain during 1970 and 1971 was as follows, in thousand tons:

	1970	1971	Change, percent
Pig iron	4,164	4,825	+16.0
Crude steel	7,429	7,794	+5.0
Hot-rolled products	5,405	5,583	+3.3

The steel industry and the Spanish Government signed an agreement in 1971 providing for relative price stability for steel products for the long term. Steel output and consumption were insufficient to offset higher labor and production costs affecting the industry in 1971 and resulted in the Government approving in June a price increase for steel averaging 4 percent.

Imports of iron and steel amounted to 856,000 tons in 1971, down 54.3 percent from 1970. Major items imported were hot coil, 177,857 tons; plates over 4.75 millimeters, 124,183 tons; tinplate, 102,008 tons; and cold roll sheets below 2 millimeters, 85,230 tons. Spain exported nearly 4 times as much steel in 1971 as it exported in 1970. Although Spain was able to achieve a quantitative balance between steel imports and exports, there remained a deficit in value, due to importation of higher cost finished products.

In 1971 UNINSA commissioned a 556,000-ton-per-year sinter plant, a 1.04-million-ton-per-year blast furnace, and a 1.96-million-ton-per-year LD steelmaking shop. The steelmaking section contained three 125-ton converters; five electric furnaces of 60, 50, 40, 35, and 25 tons capacity; and two continuous casting machines, one rated at 80 tons per hour and the other at 50 tons per hour. Most of these facilities were in UNINSA's new integrated steelworks at Veriña which were officially opened by General Franco. Although the official opening was in September, the No. 1 blast furnace was blown in May 6, and steelmaking commenced 10 days later. It was estimated that by 1975 the Veriña works would supply about one-fifth of Spain's raw steel needs with an initial steelmaking capacity of 2 million tons per year. Engineering work was done on a turnkey basis by the Krupp Co. of West Germany. The port of Gijón was being enlarged to accommodate vessels up to 200,000 tons to meet the increased demand for iron ore created by the new Veriña steelworks. As a result of UNINSA's increased production capacity at Veriña, the company closed part of its steelworks at La Felguera by decommissioning one blast furnace, the LD shop, and the blooming mill. Offers to purchase the mill were received from Argentina and Sweden.

Empresa Nacional Siderúrgica S.A. (ENSIDESA) operated Spain's largest steelmaking facility at Avilés during 1971. A unique feature of the Avilés facility was attainment of the coordinated operation of basic oxygen steelmaking and continuous casting under one roof. High-quality, low-carbon steel billets were produced principally for Spain's rolling mill industry. During the year, ENSIDESA commissioned a 150,000-ton-per-year tinning line, a 1.5 million-ton-per-year semicontinuous hot strip mill, and a 12,000-ton-per-year cold roll mill at Avilés. ENSIDESA secured agreements with Walter Brinkman of West Germany to assist with the installation of furnace equipment in the open hearth shop at Avilés, with Didier-Kellogg assisting with changes in the coke ovens. General Electric Technical Services Co., Inc. was to assist with the installation of electric and electronic equipment for a semicontinuous mill at Laminación-Este and Blaw Knox was to assist with extensions to the No. 2 pickling line. The president of INI announced that the proposed merger between UNINSA and the State-owned ENSIDESA would probably take place during 1972.

Altos Hornos de Vizcaya, S.A. (AHV), Spain's largest private sector steelmaker, continued modernization and expansion projects during 1971. A modernization of the blast furnace plant at Baracaldo-Sestao was completed in June and resulted in increased production of steel and reduced coke consumption. In September a sinter screening plant was placed in operation and expansion of the plant's blooming-slabbing mill, reheating furnaces, and auxiliary equipment was completed. Throughout the year, AHV utilized its capacity more efficiently and increased raw steel production by 168,000 tons over that produced in 1970. Despite Spain's depressed steel consumption in 1971, AHV increased sales by 14 percent with the company selling its entire output. Although the No. 2 blast furnace at Sestao was down 71 days, 1,736,950 tons of pig iron were produced, an increase of 125,517 tons over 1970 production. The Vizcaya works produced 1,228,092 tons, and Sagunto an additional 508,758 tons of pig iron. AHV's raw steel production grew 9.8 percent to 1,882,741 tons in 1971, with Vizcaya producing, 1,289,259 tons and Sagunto 593,482 tons. LD's accounted for about 81 percent of the output.

A special commission report was submitted during 1971 to the Ministry of Industry regarding Spain's proposed fourth integrated steel plant. The country's present integrated plants are AHV's Sestao, ENSIDESA's Avilés, and UNINSA's Veriña-Gijón. The report recommended locating the new plant at Sagunto near Valencia with an initial capacity of 5 to 6 million tons of hot- and cold-rolled flat products. Estimated costs were placed at $1.2 billion. The Spanish Government was to assume responsibility for construction of port facilities and a water supply. Construction phases were to include the completion and operation by 1975–76 of a cold reduction mill (capacity 1 million tons of sheet and coil); 1977–79 of coking ovens, sinter plant, one blast furnace, two 275-ton LD's (annual capacity 3 million tons), slabbing mill, and a wide hot strip mill; and by 1979–81 of a second blast furnace, third LD, second roughing mill, second hot strip mill, second cold reduction mill, and facilities for production of tinplate and galvanized sheets. Late in 1971 bids were received for construction and operation of the integrated plant. Altos Hornos del Mediterraneo (AHM), which made the only bid, was controlled by AHV (46.2 percent), U.S. Steel (15 percent), seven banks (23.8 percent), and seven savings banks (15 percent). AHM's bid was to be reviewed by a Government committee with a decision on its acceptance being made in 1972.

The stainless steel plant of Cia. Española para la Fabricación de Acero Inoxidable (ACERINOX) at Algeciras was under construction during 1971. The first phase, production of 30,000 tons per year of stainless steel sheet and coil, was scheduled for the end of 1972. A delay in construction was encountered when a local property owner filed suit to halt construction. The delay was cleared up when the Spanish Government changed the land status from residential to industrial. The company's principal aim was to meet the total stainless sheet and strip needs of Spain's processing industry. Ultimate capacity was expected to be 300,000 tons per year.

Lead, Zinc, and Associated Metals.—Spanish lead mine production which came principally from the Provinces of Murcia and Jáen decreased in 1971 to 69,502 tons, a decrease of 4 percent from that of 1970. Production of primary lead in 1971 increased 5 percent over that produced in 1970. Total reserves of lead in Spain were reported at 2,600,000 tons "measured," 846,000 tons "probable," 1,182,000 tons "possible," and 2,600,000 tons additional "estimated" resources.

Zinc mine production decreased from 98,065 tons in 1970 to 85,849 tons in 1971 with over 90 percent being mined in the Provinces of Santander and Murcia. Production of primary zinc in 1971 remained about the same as in 1970. Total known reserves of zinc were 4,268,000 tons "measured," 1,159,000 tons "probable," 1,208,000 tons "possible," and 4,500,000 tons additional "estimated" resources.

The latest figures available (1969) showed 84 mines and 30 mills active in production of lead and zinc in Spain. The number of operating units decreased 47 percent between 1965 and 1969, but zinc production increased 115 percent and lead production increased 26 percent.

Until 1969, pyrite was mined in Spain principally for its sulfur content. The recovery of lead, zinc, copper, and iron from the ash was costly and Spain exported sizable quantities to West Germany for processing. Beginning about 1965, Spain started treating 30 to 40 percent of the ash domestically. The principal company treating ash was Metalquimica del Norte Co. of Bilbao. Recent pyrite discoveries in Spain increased known reserves by about 72 million tons to 575 million tons. Annual production of pyrite was expected to reach 4 million tons by 1975. The Spanish Government hoped to eventually treat the major portion of pyrite ash within the country. A recent pyrite discovery at the old Sotiel mine in Huelva Province resulted in proven reserves of lead-zinc sulfides of 22 million tons with another 12 million tons as probable. A more important find was made by Cia. Andaluza de Piritas S.A. (APSA) at its mine at Aznacollar. According to officials of APSA, 12,000 meters of drilling proved a reserve of 50 million tons containing 23.5 million tons of sulfur; 2.4 million tons of zinc; 1 million tons of lead; 250 thousand tons of copper; 2,500 tons of silver; and about 50 tons of gold. A small flotation plant was set up to test samples obtained from the drilling program. Banco Central and Metallgesellschaft A.G. of West Germany were negotiating a partnership during 1971. The German company was to control about 40 percent of APSA and was to provide technical and financial aid. APSA expected annual production of 1.5 million tons of ore. Initial investment was to be $45.7 million and was to result in annual production of 115,000 tons of zinc ore, 45,000 tons of lead ore, 25,000 tons of copper ore, and some 1.25 million tons of pyrites. The Consolidated Mining and Smelting Co. of Canada, Ltd. (COMINCO), reported that shaft sinking on its Rubiales lead-zinc property in northern Spain was on schedule and had reached a depth of 1,000 feet on December 31, 1971. Assessment of this deposit was in progress at yearend. Rubiales mining concessions were held by a subsidiary, Exploracion Minera Internaciónal (España) S.A., in which COMINCO held a 63-percent interest. During the year, Española del Zinc S.A. announced its electrolytic zinc capacity was to be increased when a new power rectifier became operational. Spain's Cia. Minero y Metalúrgica Los Guindos, S.A., united with West Germany's Stolberger Ingenieurberatung für Bergbau und Hüttenbetrieb G.m.b.H to develop mineral projects in Spain. The agreement was to run until the end of 1975.

Manganese.—Manganesos de Huelva S.A. continued to produce manganese in Huelva Province in 1971. The company abandoned exploitation of the Pepito mine at Nerva but continued operating part of the Soloviejo deposit. Soloviejo manganese reserves were estimated at 400,000 tons. Spain's manganese production, which dropped from 23,382 tons of ore (7,539 tons manganese content) in 1969 to 10,678 tons of ore (3,452 tons manganese content) in 1970, increased to 18,006 tons of ore (5,413 tons manganese content) in 1971. Consumption of manganese in Spain went almost entirely to ferroalloy production. Manganese production was not limited by capacity, but more by the quality of ore which limited its use to silicomanganese production.

Spain's imports of manganese have been rising over the past few years. A total of 142,078 tons were imported in 1969, 200,350 tons in 1970, and 106,783 tons during the first 6 months of 1971. Principal suppliers have been Ghana, Australia, Brazil, Ivory Coast, Angola, and the Republic of South Africa.

Mercury.—Two significant developments combined to affect Spain's mercury supply-demand posture in 1971. The startup of full-scale production of COMINCO's Pinchi Lake operation in Canada deprived European producers of a substantial part of United States markets. The market was depressed by the mercury pollution scare and recessions in a number of national economies. During the first 6 months of 1971, Spain reported production of only 12,269 76-pound flasks of mercury, a decrease of 66 percent from a similar period in 1970. The Spanish Government increased tax refunds on mercury exports on August 1 from 1.5 percent to 9 percent to aid marketing.

The PNM forecasted that worldwide mercury consumption would increase at an average rate of 3 percent per annum. Spanish consumption of mercury was estimated at 3,000 flasks per year and represented a minor portion of Spain's total output of 48,843 flasks in 1971. Spanish mercury production increased 9 percent in 1971 compared with that of 1970. Mine production of mercury in 1971 was 93,650 tons of cinnabar concentrate containing 2,061 tons mercury and 129,366 tons of arsenical concentrate containing 267 tons mercury. Ore grade from Almadén was reported at 2 percent mercury in 1971, compared with an original grade estimated at 6 percent mercury. This trend of declining ore grade was expected to continue.

Tin and Tungsten.—Spanish reserves of tin and tungsten were estimated as follows in tons:

	Sn	WO_3
Known	201,600	82,000
Probable	376,000	92,000
Possible	656,000	143,000

Spanish mine production of tin decreased in 1971 by 61 percent while output of tungsten ore decreased by 33 percent, compared with 1970. About 63 percent of the tin was mined in Orense and Salamanca Provinces. The Provinces of Salamanca and La Coruña were leading producers of tungsten.

The Spanish Government announced it was giving special attention and financial aid to development of cassiterite (SnO_2) mining in the recently formed Provinces of Badajoz and Cáceres, formerly known as Extremadura. Investigations conducted by private prospectors and the Government-controlled Dirección General de Minas indicated substantial ore reserves in this region. Tin and tungsten were mined together sporadically in Extremadura during World War II. A team of engineers and geologists from the Instituto Geologicó y Minero de España visited the area and predicted small scale mining at Santa Maria, Palancar, and the La Parilla ore reserves in the near future.

The Consejo Economico de Galica suggested that a tin smelter presently under study be constructed in the industrial complex at San Ciprian de Viñas.

NONMETALS

Cement.—Spain ranked eighth in production of cement in Europe in 1970. Its per capita consumption was above the European average. Total output capacity was rated at more than 20 million tons per year. Expansions were underway in 1971 to raise capacity to about 21.5 million tons per year by yearend. Cement production in 1971 totaled 16,992,989 tons, an increase of 3 percent over 1970 production.

Fertilizer Materials.—*Phosphate.*—Some progress was made in 1971 on development of the phosphate rock deposit at Bu-Craa in the Spanish Sahara by Fosfatos de Bu-Craa S.A., an operating subsidiary of Empresa Nacional Minera del Sahara (ENMINSA). Fisons Ltd. completed a 6-month evaluation of the phosphate rock deposit and reported it to be of high quality and comparable to the Moroccan deposits. A pilot plant was operated during the year producing 1,500 tons of phosphate rock per month. This rock was used by prospective customers for testing. Construction of major facilities was underway with completion scheduled for early 1973. The pier at the new port of El Aaiun, about 100 kilometers from the mine site, was completed during 1971. The plant is designed to treat 5 million tons of crude rock per year and produce 3.3 million tons of washed and screened phosphate concentrates. Mine capacity was reported at 18 to 19 million tons of rock per year.

Plans to build Interquimica S.A. plants in the Huelva area of Spain and to utilize the Péchiney-St. Gobain processes to produce among other things 132,000 tons of phosphoric acid per year were canceled.

Potash.—Catalonia and Navarra were the principal potash producing areas in Spain. Deposits in Navarra were mined by Potasas de Navarra S.A., which was owned by INI. The Navarra mines were the first in Spain to use continuous mining machines with a modified long-wall mining method. Capacity of the Navarra mines was estimated at 240,000 tons per year. Until recently, sylvite was the only mineral mined, but in 1970 Navarra began mining and processing carnallite in a 300,000-ton-per-year plant. By yearend 1971, the company's production capacity was estimated at 550,000 tons of potash per year.

Unión Española de Explosivos and Compañia Española de Minas de Rio Tinto S.A. merged late in 1970. The new company was named Unión Explosivos Rio Tinto (ERT). ERT planned on enlarging the Cardona potash mine in northeast Spain from its present annual production of 100,000 to 250,000 tons. Potasas Victoria, one of the companies absorbed by the merger, held mining concessions of 5,000 acres with reserves of 70 million tons of potash adjacent to the Cardona mine. A second plan by ERT called for the development of a new potash project in the Llobregat River valley and would supply an additional 250,000 tons per year of potash. Recent organizational efforts have been toward a collaboration between various companies operating in the Llobregat Basin, in order to centralize production into one large mining operation supplying a refinery with a capacity of 400,000 tons per year of K_2O. Plans were underway in 1971 to double output from the Cardona mine and expand the mine at Suria. The new facilities would make possible an output of over 800,000 tons of K_2O per year from the Catalonia region. Formation of a national sales organization was being considered in 1971 by private companies and the Spanish Government.

Potash exports from Spain were mainly in the form of chloride, but small quantities of sulfate were shipped to Morocco, Algeria, and Greece. Spain's major markets for potash were in Poland, Norway, France, Colombia, the United Kingdom, and Italy.

Domestic potash consumption, which has been rising rapidly, was estimated at 250,000 tons per year.

Fluorspar.—Production of acid grade fluorspar in 1971 increased 24 percent over that of 1970. Metallurgical grade production increased by 9 percent. The fluorspar industry was dominated by two companies, Minerales y Productos Derivados, S.A. (Minersa), and Fluoruros S.A. Mining problems that have slowed the growth of Spain's fluorspar industry were solved as a result of heavy investments made during 1970. American Smelting and Refining Co. obtained a concession to exploit fluorspar deposits in the southern part of Murcia Province during 1971.

Of 170,000 tons of fluorspar exported from Spain in 1970, the United States and West Germany were the principal recipients, with smaller quantities going to Norway, the Netherlands, Italy, and Portugal.

Pyrite and Sulfur.—Production of pyrite decreased in 1971 by 12 percent from that produced in 1970. Spain's largest pyrite producer, ERT, planned on increasing production of sulfuric acid with new plants at Tarragona and Cartagena, each with a daily capacity of 500 tons. Completion of new plants under construction will bring ERT's annual productive capacity of sulfuric acid to 1,680,000 tons, making ERT Spain's largest producer. ERT's new 1.2 million tons per year pyrite plant, 70 kilometers northwest of Seville in southern Spain, was commissioned in 1971. The plant was to be managed by GEC-Elliott Mechanical Handling, Ltd., of the United Kingdom.

Metallgesellschaft A.G. of West Germany and Banco Central S.A. of Madrid formed a company to exploit pyrite mines at Aznacollar (see section on Lead, Zinc, and Associated Metals of this chapter). Originally these mines were worked by the British company, Seville Sulphur Co., and since 1960 by APSA.

A new company, Aprovechamiento Integral de Piritas S.A. (AIPSA), was organized to conduct research on the future use of Spanish pyrites, with the object of eventually constructing a pyrite plant in southern Spain. The plant was to be designed to treat approximately 1 million tons of pyrite per year, resulting in the production of 8,000 tons of copper, 20,000 tons of zinc, 5,000 tons of lead, and significant quantities of gold, silver, and iron ore.

MINERAL FUELS

Coal and Lignite.—Spain's coal production remained essentially unchanged in 1971 compared with that of 1970 and totaled 13.7 million tons. Lignite production increased 8 percent over that of 1970. Labor strikes continued to plague the coal industry with over 25,000 workers demanding higher wages. By October 1971 the strike had affected 25 out of 29 of Hulleras del Norte, S.A. (HUNOSA) mines as well as some privately owned mines in the area.

Following complete takeover of HUNOSA by the Government-run INI in December 1970, INI announced the restructuring of HUNOSA. The restructuring was part of the third development plan that called for investments of about $111 million for modernization to be completed by 1975. New coal mining equipment is an important part of the modernization. The president of HUNOSA announced an impending 15-percent increase in the price of coking coal, which was expected to affect steel prices.

A coal-fired thermal electric plant near Puertollano in the Province of Ciudad Real was being built by Compañia Sevillana de Electricidad to supply electricity to local industry.

Nuclear Energy and Uranium.—Spain's use of nuclear energy to produce electricity continued to grow. A new plant was started at Santa María de Garoña (Burgos). This is Spain's second nuclear plant and it has a generating capacity of 460,000 kilowatts.

Eximbank authorized a direct credit-finance guarantee totaling $141.5 million be established in equal shares among Hidroeléctrica Española, Compañia Sevillana de Electricidad, and Unión Electrica. The credit was to aid Central Nuclear de Almaray in financing 76 percent of the cost of purchasing United States equipment as well as services for construction and operation of two 850-megawatt nuclear powerplants. The new plants, at Almaraz on the Tagus River, were to be known as Almaraz No. 1 and Almaraz No. 2 and were to become operational between 1970–78. Other planned nuclear plants in varying degrees of development in 1971 were installation of a nuclear plant at Lemóniz, Province of Vizcaya, with two 850-megawatt units planned to become operational between 1976–78; a second installation of a 500-megawatt unit (Zorita II) at the José Cabrera plant (Zorita I), to become operational between 1976–77; installation of a plant at Ascó, Province of Tarragona, comprised of two 850-megawatt units to become operational between 1977–80; and installation of a plant at Irta (Castellón) with a capacity of 500 megawatts. The latter unit was authorized in principle several years ago but had been held up pending appeals. These projects total 6,100 megawatts and together with foreseeable expansion at Santa María de Garoña and Vandellás would bring total Spanish nuclear generated electrical power to 9,500 megawatts. Nuclear plants, which provided only 3.2 percent of total electric power in 1971, will account for 25.7 percent by 1983.

Uranium shale deposits in the Ciudad Rodrigo (Salamanca) area were investigated exhaustively by the Spanish Board of Nuclear Energy. However, the Spanish Government temporarily shelved a project to build a 400-ton–U_3O_8–per–year concentrator at Ciudad Rodrigo in favor of a more ambitious project. Plans for the new project were to be completed by INI and Junta de Energia Nuclear (JEN) by late 1971. JEN continued to mine the nearly exhausted Cardeña (Córdoba) deposit and supplied 300 tons of ore per day to the concentrator at Andujar. Andujar obtained the remainder of its requirements from ore mined by JEN in Badajoz Province.

Petroleum.—Spain's State-owned Compañia Arrendataria Del Monopolio de Petróleos, S.A. (CAMPSA), announced in 1971 the first major offshore petroleum discovery made in Spanish waters off the coast near Tarragona. Preliminary estimates indicated the deposit may be worth $1.4 billion and capable of supplying Spain's needs for 3 years.

Tenneco Oil Co. of Houston, Tex., obtained 19 permits from the Spanish Government for oil exploration covering 2.1 million acres of land in the Castille Basin east of Madrid. Tenneco expected geological studies to be completed in 1971, followed by seismic studies in 1972, and a drilling program in 1973–74. The company reportedly was committed to a 4-year exploration program involving at least four wells. A Spanish affiliate of Standard Oil Co. (N.J.) acquired a 1,020-square-mile concession in the Bay of Biscay in October 1971.

Oil consumption in Spain increased from 6.3 to 24.5 million tons between 1960 and 1970. Expansion in the domestic consumption of liquid fuels was accompanied by the development of Spanish refineries. Spain presently has seven oil refineries at Castellón, Escombreras, Algeciras, Huelva, Puertollano, La Coruña, and Santa Cruz de Tenerif. They have a combined refining capacity of 34 million tons per year. A new 5-million-ton-per-year refinery was under construction at Bilbao and additional capacity was being added to the refinery at Puertollano. The Spanish Government asked for proposals from private companies of up to 40-percent equity participation in Empresa Nacional de Petróleos de Tarragona, a company formed to build a new 7-million-ton-per-year refinery at Tarragona. The cost of the refinery was estimated at about $300 million.

The Mineral Industry of Sweden

By F. L. Klinger[1]

Adverse economic conditions in West European steel industries in 1971 led to a decline in exports of Swedish iron ore, and to reduced production and exports of Swedish steel products. Export earnings were further reduced by lower prices for steel products and for aluminum, copper, and lead. Although net imports of metals were reduced, substantial increases in the cost of imported fuel prevented improvement in the balance of trade for mineral commodities. A decline in activity of the construction industry was also evident.

Despite these conditions, production of metallic ores increased, and sizable investments in new productive capacity in mines and processing plants appeared to continue.

In the fuels sector, a new petroleum refinery was under construction. Sweden's first commercial nuclear powerplant began operating in 1971. In exploration for hydrocarbons, drilling in southern Sweden found no commercial deposits, but some traces of oil and gas were found.

A new mineral map showing the location of operating mines and significant prospects was published by the Government in 1971.

PRODUCTION

Preliminary indices of the volume of production in different sectors of the mineral industry in 1970 and 1971 were as follows:

Industry sector	(1968 = 100)	
	1970	1971
Iron ore mining	102	107
All mining and quarrying	105	111
Primary metals	110	106
Nonmetallic mineral manufacturing	107	98
Petroleum refining	131	132
All industry	115	115

Source: Central Bureau of Statistics (Stockholm). Statistiska Meddelanden, SM/I 1972:40, 1(8); Oct. 23, 1972.

The higher indices for mining and quarrying were mainly due to increases in production of iron ore in the Kiruna district and of copper ore at Aitik. Small increases were registered in output of lead and zinc concentrates. Reduced output of steel influenced the index for primary metal production. The decline in nonmetallic mineral manufacturing reflected decreased production of cement and other construction materials. In petroleum refining, the quantity of crude oil processed was about the same as in 1970, but output of petroleum products declined.

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[1] Physical scientist, Division of Ferrous Metals.

Table 1.—Sweden: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1969	1970	1971 [p]
METALS			
Aluminum:			
Primary	66,766	66,200	75,500
Secondary	19,000	20,000	20,000
Arsenic, white	16,500	16,400	[e] 16,000
Bismuth, mine output, metal content [e]	[r] 15	15	15
Copper:			
Mine output, metal content	25,150	26,283	30,200
Matte	1,793	2,277	600
Metal unrefined	--	485	8,800
Metal refined:			
Primary	39,138	36,661	34,542
Secondary	12,621	14,541	15,089
Gold:			
Mine output, metal content troy ounces	45,011	44,207	54,527
Metal, including alloys do	119,215	135,033	99,667

See footnotes at end of table.

Table 1.—Sweden: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity[1]	1969	1970	1971[p]
METALS—Continued			
Iron and steel:			
Iron ore and concentrate, gross weight:			
Direct shipping ore thousand tons	26,883	23,943	25,673
Concentrates do	6,302	7,416	8,694
Total do	33,185	31,359	34,367
Roasted pyrite, gross weight do	209	243	NA
Pig iron and sponge iron[2] do	2,675	2,793	2,815
Ferroalloys (electric furnace only) do	247	234	236
Crude steel do	5,322	5,496	5,271
Steel semimanufactures:			
Bars, rods, and sections do	1,503	1,586	1,512
Plate and sheet do	1,734	1,762	1,783
Strip do	197	167	145
Rails and accessories do	51	50	50
Pipe and tube stock do	264	272	235
Other, including forgings and castings do	163	177	167
Total do	3,912	4,014	3,892
Lead:			
Mine output, metal content	78,244	73,600	77,700
Metal (refined):			
Primary	42,100	43,484	43,341
Secondary	[r] 12,047	9,250	[e] 10,000
Manganese ore 13 to 15 percent manganese, gross weight	8,756	--	--
Selenium, elemental (refined)	[r] 168	[e] 110	[e] 110
Silicon, elemental	9,700	12,100	13,800
Silver:			
Mine output, metal content thousand troy ounces	3,683	3,948	3,895
Metal including alloys do	[r] 6,858	6,109	4,823
Uranium oxide (U_3O_8)[e]	[r] 77	80	80
Zinc:			
Mine output, metal content	90,444	93,400	95,700
Clinker (70 to 75 percent zinc)	29,500	30,800	[e] 27,000
NONMETALS			
Cement, hydraulic thousand tons	3,958	3,994	3,827
Chalk	18,489	22,000	25,800
Clays:			
Fire clay	44,492	NA	NA
Kaolin:			
Crude	23,864	[e] 30,000	[e] 30,000
Washed	4,833		
Other (klinkerlera)	49,739	NA	NA
Diatomite:			
Crude	[r] 6,669	5,870	[e] 6,100
Calcined	608	627	[e] 650
Feldspar	33,224	31,915	27,700
Fertilizer materials, manufactured, gross weight:			
Nitrogenous thousand tons	36	60	NA
Phosphatic:			
Thomas slag, gross weight do	329	352	[e] 370
Other do	NA	NA	NA
Other, including mixed do	381	313	NA
Lime (quicklime and hydrated lime) do	[r] 809	814	823
Pigments, natural mineral	1,235	1,195	NA
Pyrite and pyrrhotite (including cupreous):			
Gross weight thousand tons	495	575	592
Sulfur content do	250	289	284
Stone and gravel:			
Dimension stone:			
Unworked:			
Limestone and marble do	88	63	NA
Granite and gneiss do	245	27	28
Quartz (crude blocks) do	59	77	NA
Quartzite (crude blocks) do	21	42	NA
Other, including slate do	161	153	NA
Worked, all types do	186	160	NA
Crushed, gravel and other:			
Dolomite:			
Crude do	389	333	326
Burnt do	55		
Limestone and other calcareous:			
For cement, lime and flux do	9,827	9,922	8,637
Other do	458	1,664	1,466
Granite and gneiss do	[r] 6,614	7,767	NA
Quartz (except crude blocks) do	[r] 59	77	90
Quartzite (except crude blocks) do	[r] 21	42	46
Other do	697	NA	NA

See footnotes at end of table.

Table 1.—Sweden: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity [1]	1969	1970	1971 [p]
NONMETALS—Continued			
Sulfur:			
Elemental	6,504	5,000	[e] 5,000
Sulfuric acid (100 percent) and oleum	[r] 692,588	699,780	758,000
Talc and steatite	28,825	32,300	[e] 32,000
MINERAL FUELS AND RELATED MATERIALS			
Coal, all grades thousand tons	22	12	10
Coke:			
Coke oven do	535	531	499
Gashouse do	[r] 403	369	[e] 337
Peat:			
For agricultural use do	[r] 104	102	[e] 81
For fuel use [e] do	[r] 23	23	23
Oil shale:			
For fuel production use do	197	176	NA
For other use do	246	94	NA
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	10,659	11,050	11,407
Jet fuel do	1,296	936	1,096
Kerosine do	341	349	78
Distillate fuel oil do	20,329	24,417	26,043
Residual fuel oil do	32,741	35,751	34,206
Lubricants do	483	455	576
Other do	7,840	8,784	7,751
Refinery fuel and losses do	7,208	5,347	4,623
Total do	80,897	87,089	85,780

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, cobalt, molybdenum ore and metallic titanium, are also produced, but output is not reported and information is inadequate to make reliable estimates of output levels.

[2] Includes sponge iron as follows, in thousand tons: 1969—178; 1970—185; and 1971—174.

TRADE

Sweden's trade in mineral commodities declined in 1971. Exports of iron ore and of iron and steel semimanufactures, the principal exchange-earning commodities, declined in quantity although the balance of trade (value) for both items improved owing to higher prices for iron ore and a 9-percent reduction in imports of iron and steel. Exports of aluminum, copper, lead, and nickel increased, and imports of these and many other commodities declined; however, improvement in the overall balance of trade was mainly prevented by a significant rise in the cost of imported fuels. Average unit values of crude oil and solid fuels imported in 1971 were 27 percent higher than in 1970. The net deficit for trade in mineral commodities was approximately $685 million, almost unchanged from the 1970 level.

In terms of value, 75 percent of Sweden's exports of mineral commodities and 60 percent of imports were traded with countries belonging to the European Free Trade Association (EFTA) and the European Economic Community (EEC). West Germany and the United Kingdom remained the principal trading partners. The Soviet Union and Denmark ranked third in Swedish imports and exports, respectively.

During 1971, the exchange rate between the Swedish krona (SKr) and the U.S. dollar declined from SKr 5.17 = $1.00 at the end of the first quarter, to SKr 4.865 = $1.00 at yearend. The official rate established in December 1971 was SKr 4.8129 = $1.00. Sweden's trade in mineral commodities in 1969 and 1970 is detailed in the following tables.

Table 2.—Sweden: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum, metal, including alloys:			
Scrap	552	2,011	West Germany 1,550.
Unwrought	15,981	16,206	Norway 8,894; East Germany 5,602.
Semimanufactures	26,371	27,488	Finland 7,347; United Kingdom 7,233; Denmark 5,593.
Arsenic, oxide and acids	6,220	7,936	United States 7,387; Australia 549.
Copper:			
Ore and concentrate	1,081	3,948	Belgium-Luxembourg 2,315; East Germany 1,633.
Matte	1,800	2,315	All to Belgium-Luxembourg.
Metal, including alloys:			
Scrap	1,081	1,374	West Germany 534; Denmark 403.
Unwrought	39,175	32,104	West Germany 7,883; Netherlands 7,338.
Semimanufactures	35,078	33,884	Denmark 12,048; Norway 11,401.
Iron and steel:			
Iron ore and concentrate except roasted pyrite thousand tons	31,713	27,972	West Germany 11,317; Belgium-Luxembourg 7,936.
Roasted pyrite do	256	445	United Kingdom 227; West Germany 208.
Metals:			
Scrap do	16	15	West Germany 9.
Pig iron, including spiegeleisen [1] do	224	230	United Kingdom 55; West Germany 33.
Ferroalloys do	75	59	United Kingdom 32; West Germany 14.
Steel, primary forms do	100	99	Denmark 52; United Kingdom 20; West Germany 16.
Semimanufactures:			
Bars, rods, angles, shapes, sections do	420	426	Finland 73; United Kingdom 70; West Germany 61.
Universals, plates, and sheets do	576	572	West Germany 125; Denmark 104.
Hoop and strip do	58	68	United States 8; West Germany 8; United Kingdom 5.
Rails and accessories do	11	27	China, People's Republic of 11; Norway 8.
Wire do	60	58	United States 10; West Germany 7; United Kingdom 5.
Tubes, pipes, and fittings do	207	206	U.S.S.R. 40; West Germany 24; United Kingdom 22.
Castings and forgings, rough do	3	5	Belgium-Luxembourg 1; Denmark 1; Finland 1.
Total semimanufactures do	1,335	1,362	
Lead:			
Ore and concentrate	46,870	47,215	West Germany 42,905.
Oxides	1,143	1,502	Finland 472; Czechoslovakia 400.
Metals, including alloys, all forms	12,817	10,603	Denmark 4,486; Finland 2,797; Norway 1,281.
Magnesium metal, including alloys:			
Scrap	237	165	West Germany 79.
Unwrought and semimanufactures	22	11	Netherlands 10.
Manganese ore and concentrate	2,401	522	Czechoslovakia 350.
Nickel metal, including alloys:			
Scrap	504	495	West Germany 291; United Kingdom 107.
Unwrought	339	2,045	Netherlands 1,528.
Semimanufactures	1,645	1,280	United States 145; Netherlands 142; Italy 122.
Platinum-group metals and silver:			
Waste and sweepings value, thousands	$2,967	$2,956	West Germany $1,462; United Kingdom $1,232.
Metals, including alloys, unworked or partly worked:			
Platinum group do	$287	$443	Finland $309.
Silver do	$10,953	$10,101	West Germany $7,544; Switzerland $1,120.
Silicon elemental	6,734	9,560	United Kingdom 2,169; West Germany 1,815; East Germany 1,593.
Tin metal, including alloys:			
Scrap long tons	14	84	All to Norway.
Unwrought and semimanufactures do	64	447	Netherlands 329.
Tungsten:			
Ore and concentrate	81	279	West Germany 158; India 121.
Metal	152	93	West Germany 79; United Kingdom 5; Denmark 5.

See footnotes at end of table.

Table 2.—Sweden: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS—Continued			
Zinc:			
Ore and concentrate	159,914	179,704	West Germany 55,412; Norway 51,024; Belgium-Luxembourg 39,543.
Oxide and peroxide	350	293	Norway 183.
Metal, including alloys:			
Scrap	1,426	1,842	Norway 596; West Germany 374.
Unwrought and semimanufactures	600	602	Finland 265.
Other:			
Ore and concentrate	1,711	761	West Germany 158; India 121.
Ash and residues containing nonferrous metals	54,385	45,616	Norway 29,854; Belgium-Luxembourg 8,703.
Oxides, hydroxides, and peroxides of metals, n.e.s	94	63	Denmark 41, Norway 8.
Base metals including alloys, all forms	357	506	West Germany 132.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc value, thousands	$6	$19	NA.
Dust and powder or precious and semiprecious stone do	$16	$62	Belgium-Luxembourg $27; United Kingdom $20; Finland $13.
Grinding and polishing wheels and stones	2,484	2,459	West Germany 429; Denmark 401; United Kingdom 383.
Cement	59,094	51,136	West Germany 25,869.
Chalk	2,570	3,962	Norway 1,985.
Clays and products (including all refractory brick):			
Crude	r 1,333	647	West Germany 365; Denmark 166.
Products:			
Refractory (including nonclay bricks)	41,475	40,062	Norway 15,732; Finland 11,033; Denmark 9,462.
Nonrefractory	33,791	30,700	Denmark 9,127; Norway 7,922.
Diamond:			
Gem, not set or strung value, thousands	$344	$272	Denmark $129.
Industrial do	$54	$60	Belgium-Luxembourg $27; United Kingdom $20; Finland $13.
Feldspar and fluorspar	14,632	17,144	United Kingdom 3,448; West Germany 2,731; Italy 2,245.
Fertilizer materials, manufactured:			
Nitrogenous	54,416	57,439	India 15,413; United Kingdom 7,852.
Phosphatic, Thomas slag	26,567	58,881	East Germany 31,403; Finland 8,589.
Other, including mixed	23,934	17,040	Norway 16,700.
Graphite, natural	--	112	West Germany 100.
Lime	636	981	Norway 920; Denmark 38.
Magnesite	4	52	Norway 30.
Pyrite, gross weight	41,611	51,750	United Kingdom 51,717.
Salt and brine	188	341	Norway 236.
Stone, sand and gravel:			
Dimension stone, crude and partly worked:			
Granite, gneiss, sandstone, etc	526,265	636,576	Netherlands 474,958; West Germany 83,789; Denmark 40,141.
Marble and other calcareous	5,571	4,717	Denmark 3,469.
Slate	r 4,606	5,684	Norway 3,991; West Germany 715; Netherlands 673.
Dolomite, chiefly refractory grade	3,372	4,608	Denmark 2,051; Japan 656.
Gravel and crushed stone	808,674	1,001,734	West Germany 500,982; Denmark 449,469; Norway 37,010.
Limestone	543,539	600,016	Finland 316,891; West Germany 208,173.
Quartz and quartzite	149,603	97,679	Norway 42,729; West Germany 19,310; Denmark 17,078.
Sand, excluding metal bearing	47,531	50,243	Norway 30,629.
Sulfur:			
Elemental, all forms	4	20	All to Netherlands.
Sulfuric acid, including oleum	r 115,124	186,495	United Kingdom 143,989; West Germany 34,552.
Talc and steatite	3,876	6,383	Denmark 4,275.
Other nonmetals, n.e.s:			
Crude	29,630	30,839	United Kingdom 19,310; Denmark 4,557.
Slag dross and similar waste, not metal bearing	61,642	77,878	Norway 49,890.
Oxides, hydroxides of magnesium, strontium and barium	86	55	Denmark 41; Norway 8.

See footnotes at end of table.

Table 2.—Sweden: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
NONMETALS—Continued			
Other nonmetals, n.e.s.—Continued			
Building materials of asphalt, asbestos and fiber cement and unfired nonmetals, n.e.s	29,110	26,529	West Germany 20,197; Norway 4,731; Denmark 1,146.
MINERAL FUELS AND RELATED MATERIALS			
Coal and coke, including briquets	143,356	201,177	West Germany 96,210; East Germany 38,082.
Hydrogen, helium, and rare gases	147	161	Norway 116.
Peat, including briquets and litter	17,811	23,288	Denmark 12,186; Norway 4,704.
Petroleum refinery products:			
Gasoline..thousand 42 gallon barrels	5,189	4,739	United Kingdom 2,344; Denmark 1,298; Norway 750.
Kerosine and jet fuel........do	780	605	Norway 302.
Distillate fuel oil........do	2,019	3,330	Denmark 2,083; Norway 1,198.
Residual fuel oil........do	4,031	4,067	Denmark 2,488; Norway 1,551.
Lubricants........do	397	581	Norway 129; Finland 126.
Other, including liquefied petroleum gas........do	480	504	Denmark 294; Norway 105.
Total........do	12,896	13,826	
Mineral tar and other coal–, petroleum–, or gas–derived crude chemicals	27,510	27,810	Netherlands 14,615; United States 4,000.

[r] Revised.

[1] Includes cast iron and shot, grit, sponge, etc. of iron and steel.

Table 3.—Sweden: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum:			
Bauxite and concentrates	67,672	59,799	Greece 51,006; Guyana 6,253.
Oxide and hydroxide [1]	148,105	184,370	Jamaica 102,510; Guyana 29,936; West Germany 22,290.
Metal including alloys:			
Scrap	2,231	2,132	Norway 1,026; Finland 747.
Unwrought	34,668	40,450	Norway 26,212; Ghana 5,239.
Semimanufactures	32,210	33,361	Norway 7,187; Austria 4,136; United States 3,382.
Chromium:			
Chromite	183,976	196,903	U.S.S.R. 138,900; Turkey 32,475; South Africa 10,494.
Oxide and hydroxide	2,038	2,758	West Germany 1,592; U.S.S.R. 347; France 306.
Cobalt oxide and hydroxide	6	6	All from Belgium-Luxembourg.
Copper:			
Ore and concentrate	51,904	79,207	United States 31,953; France 19,250; Chile 10,693.
Matte	25,039	19,286	France 19,250.
Metal, including alloys:			
Scrap	12,841	8,207	United States 4,673; Denmark 1,172; France 1,138.
Unwrought	74,342	70,031	Chile 27,668; Zambia 18,458; Belgium-Luxembourg 11,444.
Semimanufactures	20,331	28,867	United Kingdom 7,152; Finland 6,053.
Iron and steel:			
Ore and concentrate, except roasted pyrite	46,976	134,560	Liberia 134,023.
Roasted pyrite	[r]2,024	3,282	All from Finland.
Metal:			
Scrap	426,256	480,872	U.S.S.R. 230,731; United States 185,981.
Pig iron, including cast iron [2]	272,269	471,992	Finland 171,682; U.S.S.R. 60,293; Norway 59,435.
Ferroalloys	99,408	103,035	Norway 35,987; India 14,085.
Steel, primary forms	65,672	57,464	Finland 12,352; United States 12,115.
Semimanufactures:			
Bars, rods, angles, shapes and sections	427,986	482,617	Belgium-Luxembourg 106,542; West Germany 100,682.
Universals, plates and sheets	881,961	861,814	United Kingdom 125,628; Belgium-Luxembourg 104,084; West Germany 61,018.

See footnotes at end of table.

Table 3.—Sweden: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS—Continued			
Iron and steel—Continued			
Semimanufactures—Continued			
Hoop and strip	80,029	106,720	Belgium-Luxembourg 40,122; West Germany 18,079; United Kingdom 13,758.
Rails and accessories	6,124	5,911	West Germany 3,755; Belgium-Luxembourg 1,099; United Kingdom 334.
Wire	24,101	30,203	United Kingdom 12,313; West Germany 3,737; Belgium-Luxembourg 3,566.
Tubes, pipes, and fittings	223,022	239,296	West Germany 90,387; United Kingdom 45,589.
Castings and forgings, rough	5,905	8,207	Poland 4,357; Norway 1,074.
Total semimanufactures	1,649,128	1,734,768	
Lead:			
Oxides	1,173	1,386	United Kingdom 636; East Germany 418.
Metals, including alloys:			
Unwrought	7,174	7,020	Peru 4,314; United Kingdom 1,519.
Semimanufactures	1,325	1,878	West Germany 905; Belgium-Luxembourg 554.
Magnesium metal, including alloys:			
Unwrought, including scrap	688	621	Norway 551.
Semimanufactures	88	104	France 41; United Kingdom 23; United States 20.
Manganese:			
Ore and concentrate	68,174	114,791	U.S.S.R. 51,120; Republic of South Africa 42,227; Gabon 19,016.
Oxides	1,105	1,241	Japan 601; West Germany 160.
Mercury 76 pound flasks	1,595	1,624	Spain 1,131; Yugoslavia 290.
Molybdenum:			
Ore and concentrate	6,613	11,558	Australia 4,034; United States 2,544; Netherlands 1,994.
Metal, including alloys, all forms	36	62	West Germany 13; United States 8; Austria 6.
Nickel:			
Matte	1,260	2,139	Canada 1,286; U.S.S.R. 703.
Metal, including alloys:			
Scrap	3,390	1,265	Netherlands 532; United States 450.
Unwrought	13,070	18,709	Norway 6,461; U.S.S.R. 3,195; United Kingdom 3,164.
Semimanufactures	1,821	4,309	Netherlands 3,174; United Kingdom 530.
Platinum-group metals and silver:			
Ore and concentrates value, thousands	$774	$781	Peru $686; Canda $95.
Waste and sweepings do	$2,036	$629	United States $256; United Kingdom $232.
Metals, including alloys, unwrought or partly worked:			
Platinum group do	$1,875	$2,169	United Kingdom $1,396; West Germany $578.
Silver do	$6,689	$5,309	United Kingdom $3,127; West Germany $1,956.
Tin, metal, including alloys:			
Unwrought, including scrap long tons	577	935	United Kingdom 481; Netherlands 249.
Semimanufactures do	148	157	United Kingdom 109.
Titanium:			
Ore and concentrate	3,463	2,857	Netherlands 1,733; United States 1,049.
Oxides	6,967	6,274	Japan 1,550; Finland 1,302; West Germany 842.
Tungsten:			
Ore and concentrate	2,440	3,577	Canada 1,286; South Korea 1,015.
Metals, including alloys, all forms	71	115	West Germany 70; United Kingdom 22.
Zinc:			
Oxide	2,436	2,159	Netherlands 740; Poland 396; Norway 359.
Metals, including alloys:			
Blue powder (dust)	246	295	Norway 259.
Unwrought	43,104	39,749	Norway 21,077; Canada 5,096; Poland 4,740.
Semimanufactures	1,371	1,240	West Germany 814.
Other:			
Ore and concentrate	60	8	NA.
Ashes and residues containing nonferrous metal	51,856	57,991	West Germany 19,069; United States 11,207; Poland 7,745.
Oxides, hydroxides and peroxides of metal, n.e.s	1,970	2,201	West Germany 749; Finland 641; United Kingdom 167.

See footnotes at end of table.

Table 3.—Sweden: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS—Continued			
Other—Continued			
Metals, including alloys, all forms	5,400	5,913	South Africa, Republic of 1,743; France 1,236; West Germany 561.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	506	3,352	Iceland 2,779; Italy 289.
Dust and powder of precious and semiprecious stones value, thousands	$527	$774	United Kingdom $320; United States $277.
Grinding and polishing wheels and stones	3,542	3,841	United Kingdom 1,502; Austria 853; West Germany 526.
Asbestos	16,102	18,794	Canada 9,111; U.S.S.R. 5,433.
Barite and witherite	1,617	2,099	West Germany 2,075.
Boron materials:			
Crude natural borates	7,974	11,066	United States 6,728; Turkey 3,876.
Oxide and acid	790	657	United States 284.
Cement	24,190	28,130	Denmark 23,093; West Germany 2,181.
Chalk	9,131	10,905	Denmark 8,157.
Clay and products (including all refractory brick):			
Crude, n.e.s. (bentonite, kaolin, refractory)	272,102	299,769	United Kingdom 231,523; United States 37,058.
Products, refractory (including nonclay brick)	120,384	126,980	Austria 37,514; United Kingdom 30,371; West Germany 27,142.
Cryolite and chiolite	431	1,585	Denmark 1,469.
Diamond:			
Gem, not set or strung value, thousands	$1,887	$1,761	Belgium-Luxembourg $1,191; Netherlands $204; Israel $168.
Industrial do	$1,032	$1,154	United Kingdom $493; Netherlands $366; Belgium-Luxembourg $178.
Diatomite and other infusorial earths	9,812	8,299	Denmark 4,644; United States 2,685.
Fertilizer material:			
Crude:			
Nitrogenous	25,677	26,292	All from Chile.
Phosphatic	521,334	508,574	Morocco 409,134; U.S.S.R. 99,435.
Manufactured:			
Nitrogenous	503,391	445,243	Norway 392,684; Netherlands 45,719; West Germany 6,313.
Phosphatic	42,523	32,226	Tunisia 29,879; Belgium-Luxembourg 2,314.
Potassic	238,831	238,766	West Germany 91,165; East Germany 64,381; Canada 33,318.
Other	41,050	81,338	Norway 67,780; West Germany 6,768; United Kingdom 5,086.
Ammonia	76,257	82,280	Norway 82,278.
Fluorspar, including feldspar	22,966	23,979	China, People's Republic of 8,735; Finland 4,657; Norway 3,167.
Graphite, natural	1,229	1,271	West Germany 640.
Gypsum and plasters	396,026	487,164	France 259,280; Poland 207,085; West Germany 18,736.
Lime	12,510	7,756	Denmark 5,316; West Germany 1,865.
Magnesite	6,836	12,772	Czechoslovakia 4,183; U.S.S.R. 3,829.
Mica, all forms	1,045	1,305	Norway 405; United Kingdom 368.
Pigments, mineral:			
Natural, crude	146	184	West Germany 104; France 49.
Iron oxides, processed	7,151	6,452	West Germany 5,809; United Kingdom 445.
Precious and semiprecious stones, except diamond value, thousands	$1,981	$443	West Germany $137; United States $61.
Pyrite	112,877	117,733	Norway 117,486.
Salt	993,414	1,102,000	Netherlands 492,862; West Germany 280,674; United Kingdom 179,008.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	77,458	66,555	Belgium-Luxembourg 33,049; East Germany 11,260.
Caustic potash	1,118	697	West Germany 447.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Marble and other calcareous stone	2,704	2,206	Italy 1,160; Belgium-Luxembourg 277.
Slate	6,142	4,464	West Germany 2,652; Norway 1,592.
Other, including granite, gneiss, etc	3,980	11,216	Norway 2,785.
Worked, all types	20,909	26,886	Portugal 22,867; Italy 1,548; Norway 522.

Table 3.—Sweden: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources 1970
NONMETALS—Continued			
Stone, sand and gravel—Continued			
Dolomite, chiefly refractory grade	24,213	20,379	Norway 19,837.
Gravel and crushed rock	52,663	64,562	Denmark 29,328; Norway 16,592; Finland 12,678.
Limestone (except dimension)	121,093	149,071	United Kingdom 90,871; Denmark 44,197; Norway 12,090.
Quartz and quartzite	8,046	17,831	Spain 12,540; Portugal 4,879.
Sand, excluding metal bearing	312,445	357,201	Denmark 230,815; Belgium-Luxembourg 109,754; Norway 10,854.
Sulfur:			
Elemental, all forms	118,340	134,640	Poland 45,637; Finland 41,341; France 32,750.
Dioxide, sulfuric acid, and oleum	25,304	83,283	Finland 52,883; Poland 12,527.
Talc, steatite, soapstone, and pyrophyllite	18,721	22,121	Norway 10,197; Belgium-Luxembourg 3,528; Austria 3,485.
Other, nonmetals, n.e.s.:			
Crude	[r] 33,839	39,402	West Germany 18,918; Norway 12,413.
Slag dross, and similar waste, not metal bearing	[r] 15,230	227	West Germany 57; United Kingdom 44; Denmark 33.
Oxides and hydroxides of magnesium, strontium, and barium	[r] 9,700	13,284	Norway 7,963; United Kingdom 3,519; Netherlands 835.
Bromine, iodine, and fluorine	16	10	NA.
Building materials of asphalt, asbestos and fiber, cement and unfired nonmetals, n.e.s	14,439	15,667	Belgium-Luxembourg 4,636; West Germany 3,808; Denmark 2,281.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	607	702	United States 412.
Carbon black	17,562	17,444	Netherlands 7,489; United Kingdom 3,784; West Germany 3,624.
Coal and briquets:			
Anthracite and bituminous coal thousand tons	1,570	1,660	United States 656; U.S.S.R. 572; Poland 238.
Lignite and lignite briquets	13,796	14,627	East Germany 9,622.
Coke and semicoke thousand tons	1,101	1,208	West Germany 546; United Kingdom 154; U.S.S.R. 134.
Hydrogen, helium and rare gases	244	437	West Germany 402.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	77,420	86,450	Nigeria 22,792; Muscat Oman 14,928; Venezuela 13,392.
Refinery products:			
Gasoline (including natural) do	22,057	21,947	Italy 6,078; Denmark 3,188; Trinidad and Tobago 2,805.
Kerosine and jet fuel do	2,992	3,805	United Kingdom 1,395; Netherlands 876.
Distillate fuel oil do	50,333	52,869	Trinidad and Tobago 5,953; U.S.S.R. 4,700; Belgium-Luxembourg 3,521.
Residual fuel oil do	57,343	69,350	Norway 5,700; Netherlands 4,482; Denmark 4,449.
Lubricants do	1,092	1,113	United Kingdom 392; Netherlands 301; West Germany 210.
Other, including liquefied gases do	1,239	1,106	United States 525; West Germany 266; United Kingdom 119.
Total refinery products do	135,056	150,190	
Mineral tar and other coal-, petroleum-, or gas-derived chemicals	23,129	18,749	Netherlands 6,268; West Germany 5,820; Belgium-Luxembourg 3,478.

[r] Revised. NA Not available.
[1] Excluding artificial corundum.
[2] Includes spiegeleisen and sponge, powder, and shot of iron and steel.

COMMODITY REVIEW

METALS

Aluminum.—Production, exports, and domestic deliveries of aluminum and aluminum alloys by the principal Swedish producer were increased in 1971, but profits were lower owing to a decline in prices. Exports of ingot and semimanufactures were about 20 percent more than in 1970, but imports declined by 11,000 tons. Imports of aluminum oxide and hydroxide increased to 204,000 tons, but imports of bauxite declined by more than 40 percent.

Gränges Essem increased productive capacity at the Sundsvall smelter in 1971. Forty-two new furnaces were brought into production, bringing the total number to 368. A third strip-casting machine was also started up. Production of aluminum ingot was 75,000 tons, 88 percent of productive capacity. The company also produced 10,400 tons of foundry alloys at Åvesta.

Copper.—Production of copper concentrate rose to 134,000 tons in 1971, about 17 percent more than in 1970. Although most of the concentrate came from complex ores mined by Boliden AB in Västerbotten and Kopparbergs counties, the increase in 1971 came primarily from the Aitik mine in Norrbotten county. Crude ore production at Aitik rose to 2.7 million tons, about 23 percent more than in 1970. Output of crude ore was scheduled to rise to 5 million tons annually in 1974. In connection with the expansion project at Aitik, Boliden ordered two power shovels with 15-cubic-yard buckets and nine 90-ton diesel-electric trucks in 1971.

Production of refined copper at Rönnskär was 49,600 tons in 1971, slightly less than in 1970, but production of blister copper for sale increased by more than 8,000 tons. Swedish exports of unwrought copper and semimanufactures increased by about 6 percent in 1971, but owing to a steep fall in prices, the total value of exports was 16 percent less than in 1970. Imports declined by about 7,000 tons, down by 8 percent in quantity and 29 percent in total value compared with the previous year.

In 1971, Gränges AB acquired about 25 percent of the ownership of Bethlehem Copper Corp. of Canada. The company was also considering a venture with a Peruvian State company, for development of the Chalcobamba-Ferrobamba copper deposits in southern Peru. Boliden AB acquired a 55-percent holding in Atlantic Nickel Mines Ltd. of Canada and may work the company's deposits in New Brunswick in conjunction with the West German firm, Preussag A.G.

Iron and Steel.—*Ferroalloys.*—Production and exports of ferroalloys in 1971 were slightly more than in 1970, but imports (103,000 tons) were unchanged. Output and exports of elemental silicon continued to increase. Imports of raw materials in 1971 included 188,000 tons of chromite and 150,000 tons of manganese ore.

Production of ferroalloys, by type, in 1969–71 were as follows:

Ferroalloy	Production (metric tons)		
	1969	1970	1971[p]
Ferromanganese	29,320	31,756	36,800
Ferrosilicon	41,136	46,875	40,900
Ferrosilicomanganese	40,071	32,714	41,100
Ferrochromium	62,396	63,705	63,700
Ferrosilicochrome	57,580	54,005	49,500
Ferromolybdenum	3,460	3,520	2,800
Ferrovanadium	670	657	400
Ferrotungsten	495	547	500
Silicon (elemental)[1]	9,732	12,063	13,300
Total	244,860	245,842	249,000

[p] Preliminary.

[1] Elemental silicon is normally included in Swedish statistics on production of ferroalloys.

Source: For 1969–70: Central Bureau of Statistics (Stockholm). Bergshantering 1970. 1972, p. 95. For 1971: Statistiska Meddelanden, SM/I 1972: 24, 1(9), July 6, 1972.

Iron Ore.—Production of iron ore in increased in 1971, but exports declined by 6 percent compared with those of the previous year. Owing to cutbacks in production of iron and steel by Sweden's principal ore buyers, deliveries of ore were substantially less than the quantities called for under 1971 contracts. Total exports to West Germany, the United Kingdom, and Belgium by the two leading Swedish producers were 2 million tons less than in 1970.

Shipments of iron ore by all Swedish producers in 1971 totaled 30.8 million tons, of which 26.2 million tons was exported and the remainder was delivered to domestic consumers. Iron ore stocks at yearend totaled 7.4 million tons, compared with 4.6 million tons a year earlier. Production and shipments in 1971 by the three largest producers were as follows, in thousand metric tons:

Company	Production	Shipments	
		Domestic	Export
LKAB	25,800	706	23,135
Gränges AB	3,670	1,732	1,445
Stora Kopparberg	NA	954	--

NA Not available.

Sources: LKAB-tidningen (Stockholm), v. 15, No. 2, 1972, pp. 4–9. Gränges AB—Annual report, 1971. Skillings' Mining Review, v. 61, No. 18, Apr. 29, 1972, p. 6.

Production of iron ore pellets continued to rise. Output in 1971 was 6.2 million tons, about 26 percent more than in 1970. LKAB produced a total of 4.7 million tons from plants at Kiruna, Svappavaara, and Malmberget; Gränges AB produced 455,000 tons of conventional pellets at Stråssa and 680,000 tons of cold-bonded pellets at Grängesberg.

Late in 1971, LKAB announced plans to build a new pelletizing plant at Malmberget. The plant will be of the Dravo/Lurgi traveling-grate type, with a production capacity of 2.5 million tons of pellets per year, and will be completed by 1974. The new plant is expected to increase the total pelletizing capacity at Malmberget to at least 3.75 million tons annually. In connection with these plans, LKAB is increasing the processing capacity of the Vitåfors concentrator; two new mill lines for magnetite were expected to be installed by 1973, and an electrostatic separation plant for hematite will be completed by early 1974.

Partly because of improvements in ore product quality, the average export value of Swedish ore in the first 11 months of 1971 was 47.8 kronor [2] per metric ton, about 13 percent higher than in 1970. Average price increases of 9 to 10 percent were reported by Gränges AB and LKAB, in contracts for 1971 deliveries. Ore prices for 1972 deliveries would be substantially unchanged, according to Gränges AB.

In 1971, Swedish ore exported from the port of Narvik totaled 19.3 million tons, including 18.7 million tons from LKAB and 0.6 million tons from Tuolluvaara Gruv AB. Exports from Luleå included 4.5 million tons from LKAB and 0.4 million tons from Tuolluvaara. All exports of Gränges AB were probably shipped from the port of Oxelösund. At Narvik, improvements in loading and unloading facilities have increased the port's shipping capacity to about 24 million tons annually.[3] Soros Associates of New York was engaged by LKAB for preliminary engineering studies in connection with plans to expand shipping capacity to 35 million tons annually by 1975.

Pig Iron and Steel.—Owing to declines in domestic and foreign demand, Swedish production and trade of iron and steel in 1971 was below the levels of 1970. In terms of volume, production of steel was down about 4 percent, exports by 3.5 percent, and imports by 9 percent. Owing to a decline in prices, however, the total value of exports declined about 9 percent, and the value of imports declined about 13 percent. Exports of alloyed and high-carbon steel, which usually account for about one-third of the volume and more than half of the value of Swedish exports of iron and steel, declined less than 5 percent in volume and 10 percent in value compared with 1970.

Consumption of finished steel (semimanufactures, excluding crude forms), was reported [4] to have increased slightly in 1971, to 4.09 million tons (4.07 million tons in 1970).

Investments in the iron and steel industry totaled approximately 647 million kronor, about the same as in 1970. Estimated investment for 1972 was 873 million kronor.[5]

Gränges AB, which produced 851,000 tons of pig iron and 854,000 tons of crude steel in 1971, planned to increase production capacity of the continuous-casting plant at Oxelösund to 475,000 tons annually. Expenditure of about $4 million was also planned for pollution control equipment at the Oxelösund and Nyby works. At Domnarvet, Stora Kopparbergs Bergslags AB (SKB) produced 972,000 tons of crude steel in 1971 and continued its program to raise production capacity for rolled steel to 1.3 million tons annually by 1975. At Luleå, Norrbottens Järnverk AB (NJA) expected to complete installation of a 100-ton Linz-Donawitz (LD) converter by yearend 1972. The LD converter will replace the present Bessemer converters, and will raise production capacity for crude steel to 1.2 million tons annually. Installation of a new blast furnace (production capacity 1 million tons of pig iron per year), and a continuous-casting machine (capacity 350,000 tons of billets per year) were scheduled for completion in 1973. Cost of the investment project was estimated at $104 million.

Consumption of selected raw materials in production of pig iron, sponge iron, ferroalloys, and crude steel in Sweden is shown in table 4.

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[2] Equivalent to about $9.25 at the prevailing rate of exchange in the first part of 1971 and about $9.84 at yearend. See section on trade.

[3] Canadian Mining Journal. Swedish Mining Industry 1971. V. 93, No. 3, March 1972, p. 74.

[4] Swedish Iron and Steel Association (Stockholm). Svensk Järnstatistik. 1972:1.

[5] U.S. Embassy, Stockholm, Sweden. State Department Airgram A-272, July 7, 1972.

Table 4.—Consumption of selected raw materials in production of iron and steel

(Thousand metric tons unless otherwise specified)

Material	Pig iron	Sponge iron	Ferro-alloys	Crude steel
Iron ore:				
Lump	383	--	(1)	30
Concentrates	--	148	2	31
Pellets	500	111	--	104
Sinter [2]	3,439	--	--	1
Coke	1,408	66	108	6
Scrap (purchased): [3]				
Foundry iron	4	--	--	80
Steel (excluding stainless)	4	--	19	1,177
Stainless steel	--	--	--	114
Chromite	--	--	172	--
Manganese ore	--	--	96	--
Dolomite, including calcined	4	3	--	95
Limestone	32	12	(1)	27
Lime	7	--	75	354
Quartz and quartzite	--	--	165	19
Fluorspar ... tons	--	--	357	10,568
Nickel, unwrought ... do	--	--	--	16,597
Aluminum ... do	--	--	814	2,557
Manganese ... do	--	--	489	1,783
Chromium ... do	--	--	--	537
Cobalt ... do	--	--	--	210
Silicon, elemental ... do	--	--	24	1,864
Oxygen:				
Liquid ... tons	--	--	--	14,942
Compressed ... thousand cubic meters	38,013	--	--	158,842
Fuel oil ... do	57	11	9	262
Electric power ... million kilowatt-hours	238	77	1,239	1,604

[1] Less than ½ unit.

[2] Estimated (on basis of table 20, p. 81 of source publication) to consist 85 percent of iron ore and 15 percent of mill scale, lime, slag and other materials.

[3] Consumption of home scrap was as follows: for pig iron, 13,000 tons of foundry iron; for steel, 108,000 tons of foundry iron, and 1,774,000 tons of steel scrap including 114,000 tons of stainless steel scrap.

Source: Central Bureau of Statistics (Stockholm). Bergshantering 1970. 1972, pp. 96–103.

Special Steel.—Production of crude forms of alloy and high-carbon steel declined in 1971, as shown by the following tabulation:

Type of steel	(Thousand metric tons) 1970	1971
Stainless	394	340
Heat-treatable, case-hardening, and spring	291	241
High-carbon (unalloyed)	251	228
Tool	116	101
High-speed	26	27
Free-machining	11	9
Other, including ball-bearing	441	429
Total	1,530	1,375

The decline in production was accompanied by reduced exports and imports of alloy and high-carbon steel semimanufactures. Compared with 1970, exports of these items[6] declined 5 percent in quantity (to 394,000 tons) and 11 percent in value (to $291 million). Imports declined about 12 percent in both quantity and value (85,500 tons valued at $41 million). Lower prices received for Swedish exports of stainless steel products in 1971 were reported by Gränges AB to be due to increased availability in European markets of stainless steel from Japan, often at prices below the production cost of European mills.

During 1971, a 140-ton ASEA–SKF[7] ladle furnace was installed at the Oxelösund steelworks by Gränges AB.

At Hällefors, SKF began production of high-quality steel using its newly developed melting/refining (MR) system. In this system, a twin-shell arc furnace unit, consisting of two 60-ton shells served by one preheating roof and one electrode roof, is used to preheat, melt, and partially refine a charge which is then vacuum-refined in a 60-ton ASEA–SKF furnace. The system was developed as an alternative to the acid open-hearth process for production of bearing steel. Compared with a conventional electric arc furnace, the twin-shell unit was said to offer operational flexibility (two types of steel can be treated at the same time), lower power consumption, and lower investment costs.[8]

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[6] As listed under subdivision 73.15 (Brussels Trade Nomenclature) in Utrikeshandel (Foreign Trade) for December 1970 and December 1971.

[7] Allmänna Svenska Elektriska Aktiebolag (ASEA) —Svenska Kullagerfabriken (SKF).

[8] Metal Bulletin (London). No. 5656, December 7, 1971, p. 28. Pitt, R. S. The SKF-MR System. Iron and Steel, v. 45, No. 2, April 1972, pp. 199–203.

In other developments, Avesta Jernverks AB was planning to install a 50-ton Union Carbide argon-oxygen converter by mid-1974, for a total project cost of about $4.3 million. The unit is expected to increase production capacity of the firm's steel melting shop by 30 percent. Elsewhere, Uddeholms AB was reported to have developed a new tool steel for die casting and hot pressing.

Tungsten.—Preparations for reopening the Yxsjöberg tungsten-copper-fluorspar mine were continued by AB Statsgruvor in 1971. Production was expected to begin in 1972. Planned output was about 150,000 tons of crude ore per year, yielding about 500 tons of scheelite concentrate, 350 tons of chalcopyrite concentrate, and 5,000 tons of fluorspar concentrate. The mine was last worked in 1963, closing when tungsten prices declined. Since then, all Sweden's requirements for tungsten have been met by imports. Imports in 1971 included 2,800 tons of tungsten ore, 200 tons of tungsten compounds, and 28 tons of tungsten.

Uranium.—Experimental extraction of uranium was continued at Ranstad by AB Atomenergi. The company has been working for several years to reduce the cost of extraction to less than $10 per pound U_3O_8, but has not been successful owing to the low grade of the deposits (0.03 percent uranium, in shale). However, the resources are large and are the only known domestic resource capable of supplying Sweden's uranium requirements, which are expected to grow to 2,500 tons annually by 1985. In a report to the Government in mid-1971, the company proposed expanding the Ranstad mine and mill to produce 1,250 tons of uranium annually, about nine times the present capacity. Cost of the development was estimated at about $85 million. The company estimated the project would take 7 years to complete, and that uranium oxide could be produced at a cost of about $9.50 per pound, assuming a 25-year amortization period and an interest rate of 7 percent.

NONMETALS

Cement and Other Construction Materials.—Output of bricks and cement declined slightly in 1971, along with decreased activity in building construction. The number of buildings started, under construction, and completed were all less than in 1970. Investment in the brick and cement industry, amounting to about $25 million in 1971, was expected to decline slightly in 1972.

Imports of sand and gravel, crushed stone, cement, and gypsum increased in 1971: imports of kaolin and other clays declined. Exports of cement, gravel and crushed stone were substantially higher than in 1970, but exports of building stone declined to 597,000 tons.

Under a contract signed in 1971 with two building materials firms, the Reymersholm Works of Boliden AB will deliver 200,000 to 300,000 tons of byproduct gypsum per year for use in wallboard and cement products. The gypsum is produced in the manufacture of phosphoric acid at a new plant near Hälsingborg. As production of acid increases, output of gypsum was expected to rise to 500,000 tons per year in 1973. The company said that about $3 million had been invested to make the gypsum commercially acceptable. Unless additional markets are found, the product will have to be wasted. Imports of gypsum by Sweden in 1971 totaled 505,000 tons.

A map showing the location and operating status of metallic and nonmetallic mineral deposits and rocks of industrial interest in Sweden was published in 1971 as an appendix to a Government study on regional planning.[9] The map shows the numbers of operating mines or quarries for the nonmetallic commodities listed below, as follows: feldspar (2); granite and gneiss (12); kaolin and refractory clays (2); limestone and dolomite (18); olivine (1); quartz and quartzite (11); quartz sand (5); sandstone primarily used for cement (3); and talc (1).

MINERAL FUELS

Coal and Coke.—Imports of solid fuels in 1971 declined 8 percent in volume compared with 1970, but the total value increased 17 percent, to more than $80 million. Imports of coal declined by about 260,000 tons, but imports of coke increased slightly, to 1.22 million tons. A small quantity of coal continued to be produced in southern Sweden by Höganäs AB as a byproduct of clay mining.

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[9] Industridepartmentet (Stockholm). Statens offentliga utredningar (SOU); 1971:75, Separatkarta F (scale 1:4,000,000).

Construction of a coking plant with an output capacity of 800,000 tons of coke per year was proposed for the Government-owned steelworks at Luleå. Estimated cost of the proposed plant was about $71 million.

Nuclear Energy.—Sweden's first commercial nuclear powerplant began supplying power to the national grid in August 1971. The plant, known as Oskarshamn I, is owned by Oskarshamnsverkets Kraftgrupp AB, a group of private utility companies. The plant was expected to reach a power output of 350 megawatts of electricity early in 1972. A second plant, with a planned capacity of 580 megawatts, was under construction for the same company and was scheduled for operation in 1974.

Near Göteborg, two powerplants (Ringhals I and II) under construction for the State Power Board were also scheduled to begin operation in 1974. Capacities of these plants will be 760 and 820 megawatts, respectively. In 1971, contracts for two 900-megawatt reactors (for Ringhals III and Forsmark I plants scheduled for operation in 1978) were announced by the State Power Board, one with Westinghouse Electric Co. and the other with a Swedish company, ASEA-Atom AB.

Petroleum.—*Exploration.*—Oljeprospektering AB, the Swedish exploration company in which the Government has a 50-percent interest, was drilling near Trelleborg in 1971 but reportedly abandoned the hole in midyear and was moving the rig to the island of Gotland. Five holes have been drilled in southern Sweden, with traces of oil and/or gas found near Höllviken, Köpingsberg, and Ljunghusen.

Crude Oil Imports and Refining.—Imports of crude oil in 1971 totaled 11.9 million tons. The volume was 1.3 percent more than in 1970, but the total value was up 29 percent to approximately $250 million.

The Swedish consumers' cooperative, Oljekonsumenterna (OK), began building a refinery near Lysekil. The plant will have a refining capacity of 7 million tons annually, and is scheduled for completion in 1974. Total refining capacity in Sweden was about 13 million tons per year in 1971.

Preliminary data indicated that total refinery throughput in 1971 was 12.2 million tons, about the same as in 1970, but that output of refined products was about 4 percent less. Consumption of fuel oils declined, partly because of increased availability of hydroelectric power. Imports of petroleum products declined about 8 percent, and exports declined about 11 percent. Fuel oils continued to be the principal products traded, accounting for 85 percent of imports and 70 percent of exports in 1971.

Inland consumption of petroleum products in 1970 and 1971 was reported as follows, in thousand metric tons:

Product	Inland consumption	
	1970	1971
Gasoline	2,825	2,886
Aviation fuels	(1)	(1)
Kerosine	226	158
Gas/diesel oil	9,103	8,744
Residual fuel oil	13,764	11,992
Other	1,592	1,459
Total	27,510	25,239

[1] Included with "Other."

Source: Organization for Economic Cooperation and Development (OECD), Paris. Provisional Oil Statistics by Quarters. Fourth Quarter, 1971; 1972, pp. 15–21.

The Mineral Industry of Taiwan

By K. P. Wang[1]

Taiwan's processing activities in minerals continued to outweigh indigenous extraction in value by more than 10 to one, because of the scarcity of local resources. The mineral processing sector accounted for 17.6 percent of the 1971 gross national product (GNP), compared with 1.4 percent for the mining sector. Both fields made progress over 1970, nonetheless, with mineral processing gaining about 15.4 percent and mining just over 5 percent. Growth in mineral processing was considerably greater than GNP growth in terms of 1966 constant dollars. Estimated GNP for 1971—the third year of the fifth 4-year plan (1969–72)—was $6.237 billion at current prices[2] and $5.096 billion at 1966 prices, compared with $5.461 billion and $4.575 billion, respectively, for 1970. This also meant that real GNP growth was much larger than the 7-percent annual average originally projected for the 4-year plan. Breakdown by value of output for specific mineral-related sectors was as follows, in million U.S. dollars:

Economic sector	1970	1971
Overall mining	$81.5	$85.8
Coal	49.4	49.0
Metals	7.2	7.2
Oil and natural gas	17.0	20.5
Salt evaporation	4.2	5.3
Nonmetals and quarrying	3.7	3.8
Manufacturing of mineral and related products	955.0	1,102.0
Chemical products	361.0	429.0
Oil and coal products	231.0	270.0
Nonmetallic mineral products	149.0	180.0
Base metals	183.0	189.0
Metal products	31.0	34.0

Taiwan's efforts to build an integrated iron and steel plant based upon imported raw materials and conventional smelting began to take shape in late 1971. The Austrian firm Vereinigte Österreichische Eissen und Stahlwerke A.G. (Voest Steel Corp.) agreed to participate in a joint venture, providing technical aid and one-fifth of the capital and loans. The $322 million project, with $80 million as investment capital, is scheduled to produce about 1.1 million metric tons of steel products per year by 1976, or one-half of the ultimate capacity. The Taiwan Aluminum Corp. (TALCO) completed the first stage expansion of its integrated Kaohsiung works in June and immediately embarked on a program to expand capacity to 70,000 tons of ingot annually by 1976.

The China Petroleum Corp. (CPC) doubled capacity of its Kaohsiung refinery with the completion of a new 100,000-barrel-per-day unit. A similar project in the north, probably at Shenao, was still on the drawing boards. The coal industry had more than its usual share of difficulties because of the damage to mines by typhoons in September. The cement industry had an excellent year, however, with output and domestic demand sharply up. The long-term outlook for cement exports was not encouraging because of the expanded capacity elsewhere in the Far East. Construction was in progress on a 100,000-ton-per-year mixed fertilizer plant at Kaohsiung.

Taiwan's output of electric power surpassed 15 billion kilowatt-hours in 1971, roughly 15 percent higher than that of 1970. The bulk of Taiwan's power was produced by the Taiwan Power Co. (TPC). Taiwan's installed power capacity topped the 2.7 million kilowatt mark at yearend and was scheduled to more than double by 1976. Construction was underway on two nuclear plants in northern Taiwan at a total cost of $290 million and a combined capacity of 1.6 million kilowatts. Two additional nuclear installations are planned before the end of the decade. In 1971, Taiwan's industries consumed just over 10 billion kilowatt-hours of electricity, including nearly 5.5 billion kilowatt-hours in the minerals and related industries. Estimated breakdown within the minerals and related industries was as follows, in million kilowatt-hours: iron and steel, 1,026; basic industrial chemicals, 822; cement, 681; chemical fertilizers, 594; aluminum, 523; alkalis, 500; other chemical products, 500; mining and quarrying, 475; metal products, 215; and ceramics, 130.

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[1] Supervisory physical scientist, Division of Nonmetallic Minerals.

[2] Where necessary, values have been converted from New Taiwan dollars (NT$) to U.S. dollars at the rate of NT$40 = US$1.00.

A revised Statute for the Encouragement of Investment, which permits 100 percent foreign ownership, went into effect January 1, 1971. Incentives for investors include total remission of all earnings and after two years, 15 percent of invested capital yearly; a 5-year income tax holiday or accelerated depreciation; exemption or deferral of levies on imports of machinery and materials; and a guarantee against expropriation for 20 years. Taiwan has also taken steps to simplify administrative procedures. In considering investment proposals, emphasis will be placed on sophisticated production facilities, significant input of technology, employment opportunities for nationals, foreign exchange earnings, and maximum use of local resources and capabilities. Particular fields of interest for attracting foreign capital would include energy development, steel, shipbuilding, machinery, petrochemicals, aluminum and copper smelting, electronics, and textiles.

With total foreign investment approvals up 17 percent in 1971 over that of 1970, Taiwan's investment climate continued to be attractive compared with other Asian countries. The exchange rate between U.S. dollars and new Taiwan dollars was not affected by the realignment of the dollar against the yen. This meant that the Japanese and the Europeans were placed at a slight disadvantage compared with Americans. The Japanese have held back in investments for political reasons, whereas the Europeans and Americans showed strong interest in investments in Taiwan.

PRODUCTION

Coal output declined another 8 percent, although value showed only a slight drop. Crude oil and natural gas production each gained about one-fifth in quantity. Neither was of any consequence by world standards, but natural gas was important to the domestic economy. The real significance in oil was in the production and consumption of refinery products derived from imported crude, which far overshadowed domestic crude in overall oil supply. Production of gasoline, diesel oil, and fuel oil in 1971 went up 12.5 percent, 6.0 percent, and 5.6 percent, respectively, over that of 1970.

Steel ingot output increased one-third during 1971. Aluminum production showed little change, with newly added capacity negated by electrical power shortage. Copper production was also stationary, despite the introduction of more leaching operations.

The chemical fertilizer industry showed a gain in compound fertilizers, a decline in urea production, and no notable change in ammonium fertilizers and superphosphates. An expansion program in salt resulted in a one-fourth rise in production. Increased domestic demand for cement absorbed the one-sixth growth in output. The marble industry made a significant increase of 17 percent.

Table 1.—Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971[p]
METALS			
Aluminum:			
Alumina, gross weight	44,217	41,817	43,011
Metal, primary	22,108	26,991	26,546
Sheet	13,678	14,692	[1] 14,635
Copper:			
Mine output, metal content [e]	2,300	2,500	2,400
Metal, refined, secondary	3,244	3,752	3,670
Gold, metal, primary ... troy ounces	21,486	22,550	19,500
Iron and steel:			
Iron ore and concentrate	7,847	5,870	--
Pig iron ... thousand tons	78	56	77
Ferroalloys (ferrosilicon)	1,718	5,039	7,675
Steel ingots and castings ... thousand tons	271	294	392
Silver, metal, primary ... thousand troy ounces	81	95	74
NONMETALS			
Asbestos	3,081	2,842	2,327
Cement ... thousand tons	4,088	4,305	5,043
Fertilizer materials, manufactured:			
Urea (46 percent N) ... thousand tons	257	180	140
Ammonium sulfate (21 percent N) ... do	418	398	401
Ammonium anhydrous ... do	147	156	142
Nitrochalk (20 percent N) ... do	54	46	18
Compound fertilizer (20 percent N, 5 percent P_2O_5, 10 percent K_2O) ... do	121	118	141
Calcium superphosphate (18 percent P_2O_5) ... do	197	190	195
Gypsum	5,123	11,325	16,338
Lime ... thousand tons	110	128	171
Marble ... do	1,292	1,286	1,510
Pyrite and pyrrhotite (including cupreous): [2]			
Gross weight ... do	38	40	45
Sulfur content [e] ... do	14	15	17
Salt, marine ... do	383	535	670
Stone:			
Dolomite ... do	59	64	91
Limestone ... do	7,406	NA	7,564
Sulfur elemental, native other than Frasch [3]	4,830	6,060	5,191
Talc and related materials, soapstone	24,373	38,717	39,042
MINERAL FUELS AND RELATED MATERIALS			
Coal, bituminous ... thousand tons	4,645	4,473	4,097
Coke ... do	253	279	254
Natural gas [4] ... million cubic feet	31,553	32,400	38,500
Petroleum:			
Crude ... thousand 42-gallon barrels	581	638	782
Refinery products:			
Gasoline, aviation and motor ... do	3,811	4,519	5,090
Kerosine ... do	125	158	291
Jet fuel ... do	3,735	4,496	[e] 4,600
Diesel oil ... do	5,376	7,243	7,675
Fuel oil ... do	14,874	16,812	17,750
Liquefied petroleum gas ... do	993	1,370	1,440
Asphalt ... do	746	945	950
Lubricant oils ... do	196	231	260
Other, including unspecified [5] ... do	901	1,025	1,017

[e] Estimate. [p] Preliminary. NA Not available.

[1] Taiwan Aluminum Corp. production only, does not include small quantities that may have been produced by independent producers.

[2] From Chinkuashih only.

[3] Additional sulfur produced from oil refineries.

[4] Includes unknown amount processed into natural gas liquids by field plants.

[5] Includes only solvents and base oils, according to Chinese definitions.

Source: Industry of Free China (Taipei, Taiwan). February 1972, pp. 94–111.

TRADE

Taiwan's total foreign trade rose by 33.2 percent in 1971, with exports totaling $2.14 billion and imports, $1.95 billion. Exports and imports made gains of 38 and 28 percent, respectively. In 1971 mineral and metal products represented 5 percent of all exports and 16 percent of all imports, reflecting Taiwan's reliance on imported raw materials. Table 2 shows the breakdown of mineral items traded, in terms of value.

Iron and steel products have been the foremost items of metal imports, mainly sheets, plates, wire, rods, and pipes. Petroleum imports were comprised mainly of crude oil and secondarily of fuel oil and lubricants. Nonferrous metals have been sizable as an overall category, somewhat evenly split among copper, lead, zinc, and aluminum. Steel scrap more than doubled during the year. Annual sulfur imports amounted to between $6 and $8 million; phosphate rock, $2 and $4 million; and bauxite, $1 and $1.5 million.

Specific items of mineral exports showed little change from 1970. Cement exports were considerably greater, however, and there was concern about future markets. Japan normally imports Taiwan's entire output of mine copper for custom smelting.

Table 2.—Value of principal mineral exports and imports

(Million dollars)

Commodity	1969	1970	1971 p
EXPORTS			
Iron and steel products	$24.2	$51.7	$51.3
Nonferrous metals	8.8	12.2	10.5
Copper, primary materials [1]	3.5	4.7	8.0
Cement	10.7	15.2	19.7
Glass products	9.0	10.3	10.8
Refined oil products e	8.0	7.0	8.0
IMPORTS			
Iron and steel products	100.6	117.5	157.1
Scrap metals	10.2	11.6	e 25.5
Nonferrous metals	22.0	33.9	43.0
Natural phosphates	3.4	3.0	2.8
Chemical fertilizers	12.1	5.6	e 4.5
Crude oil [2]	52.7	59.7	e 72.0
Lubricants	3.9	4.1	e 4.1

e Estimate. For 1971, estimates were mainly made on the basis of 10-month figures. p Preliminary.

[1] Japan's imports of copper ore and concentrate, cement, copper, and copper matte.

[2] Includes diesel fuel. Fuel oil seems to be part of these figures also; in 1969, this item was worth $9 million.

Source: Industry of Free China (Taipei, Taiwan). February 1971, 201 pp.

Table 3.—Taiwan: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum metal including alloys, all forms	[r]6,583	7,165	South Vietnam 1,908; Japan 1,004; Indonesia 869.
Copper:			
Ore and concentrate	11,033	9,023	All to Japan.
Metal, including alloys, all forms	1,762	3,358	Hong Kong 1,589; Japan 1,070; Iran 369.
Iron and steel:			
Metal:			
Scrap	[r]14,403	33,837	Japan 24,045; Republic of Korea 6,152; Malaysia 1,800.
Pig iron, ferroalloys and similar materials	[r]434	6,844	Japan 2,014; Indonesia 1,231; Malaysia 872.
Steel, primary forms	6,080	17,001	Ryukyu Islands 11,235; Philippines 2,792; Japan 1,150.
Semimanufactures:			
Bars, rods, angles, shapes, sections ... thousand tons	80	212	Indonesia 74; Hong Kong 65; Malaysia 9.
Universals, plates and sheets ... do	40	50	Republic of Korea 13; Indonesia 7; Kuwait 5.
Other ... do	48	65	NA.
Lead metal including alloys, all forms	(1)	NA	
Manganese metal	63	NA	
Tin metal including alloys, all forms	16	20	NA.
Titanium oxide	1	NA	
Zinc metal including alloys, all forms	3	NA	
Other base metals, including alloys, all forms	588	NA	
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc.	71	NA	
Asbestos	45	151	NA.
Cement ... thousand tons	553	750	South Vietnam 517; Hong Kong 164; Brunei 27.
Clays and products (including all refractory brick):			
Crude clays, n.e.s.	148	NA	
Products	6,751	34,656	Hong Kong 16,571; Malaysia 6,888; South Vietnam 2,600.
Fertilizer materials:			
Manufactured:			
Nitrogenous	90,008	17,278	All to South Vietnam.
Potassic	1,996	NA	
Others, all forms	9,509	64,093	All to South Vietnam.
Ammonia	[r]705	NA	
Graphite, natural	10	NA	
Mica, crude, including splittings and waste	1	NA	
Salt and brines	7,813	--	
Sodium and potassium compounds, n.e.s.	3,325	NA	
Other nonmetals, n.e.s.:			
Crude	133,027	240,332	Hong Kong 143,413; Singapore 68,400.
Slag dross, and similar waste, not metal bearing	1,886	1,852	All to Japan.
Building materials of asphalt, asbestos, and fiber cement and unfired nonmetals, n.e.s.	51	NA	
MINERAL FUELS AND RELATED MATERIALS			
Carbon black and gas carbon	22	NA	
Coal and coke, including briquets	10,811	26,722	Japan 15,201; Singapore 4,282; Thailand 2,620.
Petroleum refinery products:			
Gasoline (including natural) thousand 42-gallon barrels	264	16	NA.
Kerosine ... do	--	28	All to Hong Kong.
Distillate fuel oil ... do	984	997	Indonesia 376; Ryukyu Islands 271; Japan 95.
Residual fuel oil ... do	266	--	
Lubricants ... do	294	347	Japan 160; Philippines 90; Republic of Korea 59.
Other ... do	[r]208	336	South Vietnam 255; Indonesia 50.
Mineral tar and other coal, petroleum, or gas derived crude chemicals	283	6,764	Hong Kong 5,236.

[r] Revised. NA Not available.

[1] Less than ½ unit.

Table 4.—Taiwan: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum:		
Bauxite and concentrate ... thousand tons	106	126
Metal, including alloys:		
Scrap	1,577	3,131
Unwrought and semimanufactures	[r] 3,884	10,249
Arsenic, natural sulfides	17	NA
Cobalt oxide and hydroxide	7	NA
Copper:		
Ore and concentrate	3	NA
Metal, including alloys, all forms	[r] 7,317	10,938
Iron and steel:		
Ore and concentrate ... thousand tons	58	73
Metal:		
Scrap ... do	242	210
Pig iron, ferroalloys and other similar materials ... do	[r] 41	38
Steel, primary forms ... do	39	32
Semimanufactures ... do	[r] 497	609
Lead metal including alloys, all forms	2,943	4,156
Manganese oxide	1,565	NA
Mercury ... 76-pound flasks	1,104	NA
Nickel metal including alloys, all forms	215	310
Tin metal including alloys, all forms	459	533
Titanium dioxide	4,641	NA
Zinc metal including alloys, all forms	[r] 10,714	15,200
Other:		
Ore and concentrate	[r] 4,117	11,852
Ash and residue containing nonferrous metals	2,237	2,758
Base metals, including alloys, all forms, n.e.s	[r] 470	434
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc	2,271	2,785
Asbestos	5,949	6,589
Cement	6,439	8,477
Clays and products (including all refractory brick):		
Crude clays, n.e.s	467	NA
Products	2,973	4,318
Fertilizer materials:		
Manufactured:		
Nitrogenous	[r] 199,128	12,282
Potassic	134,666	117,989
Other, including mixed	9	NA
Graphite, natural	4,432	NA
Gypsum ... thousand tons	94	125
Mica, crude, including splittings and waste	39	NA
Sodium and potassium compounds, n.e.s.:		
Caustic soda	3	NA
Caustic potash, sodic and potassic peroxides	145	NA
Sulfur, elemental, all forms ... thousand tons	186	NA
Other:		
Crude	160	229
Slag, dross, and similar materials not metal bearing	4,119	10,675
Building materials of asphalt, asbestos, and fiber cement, and unfired nonmetals, n.e.s	408	470
MINERAL FUELS AND RELATED MATERIALS		
Carbon black and gas carbon ... thousand tons	5	NA
Coal and coke, including briquets ... do	201	76
Petroleum:		
Crude and partly refined ... thousand 42-gallon barrels	22,301	26,038
Refinery products:		
Distillate fuel oil ... do	5,606	6,620
Lubricants ... do	[r] 257	283
Mineral jelly and wax ... do	[r] 34	42
Other ... do	[r] 138	185
Mineral tar and other coal, petroleum, or gas derived crude chemicals	[r] 4,428	6,917

[r] Revised. NA Not available.

COMMODITY REVIEW

METALS

Aluminum.—In June 1971, the Government-owned TALCO, sole producer of primary aluminum in Taiwan, completed its first-stage expansion plans by raising alumina capacity to 76,000 metric tons per year and aluminum capacity to 38,000 tons, with the help of the French company, Péchiney. The target for 1976 is 70,000 tons of aluminum. Enlarged capacity did not mean increased output, however, because of the sluggish world aluminum market in 1971 and local power restrictions during the latter half of the year. Thus, TALCO's ingot production was about the same as the year before and only three-fourths of the target of 35,000 tons.

In 1971, TALCO also produced 14,635 metric tons of aluminum sheets, 10,389 tons of aluminum products, 2,900 tons of extrusions, and 1,612 tons of foil. Its hot-rolling capacity of 50,000 tons and cold-rolling capacity of 23,000 tons per year were being greatly expanded. Other new projects include an aluminum can plant, an alloy wire shop, a shipping container and truck body shop, an aluminum refrigerator-evaporator shop, and a superpurity aluminum plant.

In addition to TALCO, there were two other important producers of aluminum extrusions and rolled products, the China Wire & Cable Co. and the Walsin Electric Wire & Cable Co., plus many utensil producers with small rolling mills. Unlike TALCO, which imports bauxite as the starting raw material, all other firms depend upon aluminum ingots and semimanufactures purchased from TALCO and foreign sources. Independent producers were capable of producing about 1,000 tons of sheets and 4,000 tons of extrusions per year. The utensil makers did a great deal of export business, selling 1,609 tons abroad in 1970 and 1,303 tons in the first 6 months of 1971.

To meet operational requirements, Taiwan's producers of aluminum products imported 9,515 metric tons of aluminum ingot and 734 metric tons of aluminum semimanufactures in 1970 and exported 1,020 tons of ingot, 3,672 tons of sheets and plate, and 2,473 tons of various other semimanufactures. The pattern of the first half of 1971 showed a great change as Taiwan imported 2,124 tons of ingot (exports were negligible) and 300 tons of aluminum semimanufactures and exported 1,093 tons of sheets and plates and 1,183 tons of other semimanufactures.

Whereas 1971 was a dull year for the Taiwan aluminum industry, the outlook for 1972 is hopeful. A power expansion program will require more aluminum. A 375-kilometer freeway now being built will also mean greater use of this metal. New container and truck body plants are expected to provide a large market for aluminum. Aluminum uses for building and packaging are expected to increase at a faster rate than economic growth. TALCO will be geared to meet these increases in demand, producing between 33,000 and 35,000 tons of ingot. It expects to be operating at full capacity by May 1972, at which time the 90 MW diesel engine power plant will be completed.

During 1971, TALCO imported bauxite from two adjoining mines in Johore, Malaysia, and Brunei. Taiwan has imported well over 100,000 tons of bauxite annually in the last three years. During 1971, TALCO consumed 523 million kilowatt-hours of electricity, or just under 20,000 kilowatt-hours per metric ton of ingot, and approximately 12,000 tons of caustic soda.

Copper.—The Government-owned Taiwan Metal Mining Corp.'s mine at Chinkuashih continued to dominate the local copper scene. Taiwan Metal produced by far the bulk of the areas's mine copper and electrolytic copper, which totaled about 2,400 metric tons and 3,670 metric tons, respectively, in 1971. Chinkuashih turned out 15- to 20-percent-grade copper concentrate, 25- to 30-percent-grade cement copper, and 44-percent-grade copper matte. The entire output was sent to Japan for smelting; the 1971 Japanese imports were reported to be 9,595 metric tons of concentrate and 4,088 tons of cement copper and matte. Precious metals and copper were returned to Taiwan. Chinkuashih also produced more than 30,000 tons of pyrite in 1971 as a byproduct.

Taiwan Metal's refinery uses copper and brass scrap for raw materials. The company does not produce wire and other rolled products, which are turned out by small independent operators. In an effort to become integrated, Taiwan Metal has made arrangements to erect a modest fabrication plant to produce 200 tons of copper strip, 400 tons of brass strip, and 1,200 tons of copper wire per year. Initial financial arrangements were already made; however, a promised loan from the Asian Development Bank was subsequently cancelled.

Copper exploration in the Chimei area of eastern Taiwan was concluded with no conclusive results. Foreign companies were no longer interested in this porphyry prospect. There was talk that leaching tests might be made for Chimei. Much more significant and practical was a plan to expand leaching at Chinkuashih.

Iron and Steel.—Taiwan's aspirations to build a large integrated steel industry were finally realized. After U.S. and Japanese firms decided against participating in such a venture, help came from an unexpected source in Europe, specifically the Voest Steel Corp. of Austria, developer of the basic oxygen furnace (BOF). The Chinese would be represented by the China Iron and Steel Corp., Ltd., owned jointly by the Chinese Government and private stockholders. A licensing agreement was signed in the fall of 1971, and construction was scheduled to begin in 1972. Plans called for an initial outlay of $322 million, $258 million in foreign currency and $64 million in domestic currency. Voest will provide $16 million in investment capital, or about one-fourth of the Chinese investment. In addition, Voest will arrange for a loan of $50 million from a consortium of Austrian banks. The remaining $192 million will come from domestic and other European banks and financiers. Most of the equipment must be bought from the countries furnishing the loans from abroad —Austria, West Germany, the United Kingdom, and Belgium.[3]

This integrated steel project, based mainly upon imported raw materials and the conventional blast furnace and BOF, will be built in two stages, with production to commence in 1976. In the first stage, 110,000 metric tons of wire products, 290,000 tons of reinforcing bars, 400,000 tons of flat rolled products, and 300,000 tons of billets will be produced per year. In the second stage, 360,000 tons of cold-rolled sheets, 100,000 tons of tin plate, 200,000 tons of hot-rolled sheets, and 400,000 tons of plates will be added to the annual capacity. Since these tonnages are in terms of finished products, steel output must be correspondingly higher.

Taiwan's Iron and Steel Industry Union had about 220 member firms in 1971, headed by the Taiwan Iron Manufacturing Corp. and the Tang Eng Iron Works. Collectively, these many small companies had a combined annual capacity of about 1.6 million metric tons of products and a production of roughly 1.3 million tons in 1971. During the year, net imports of steel products were 300,000 tons. Approximately one-half of Taiwan's iron raw materials came from local obsolete ships; most of the rest was imported scrap and semimanufactures for further processing. Pig iron facilities are inconsequential, and, therefore, little iron ore is needed. In mid-1971, Taiwan had about 110 electric furnaces, 280 iron foundries, 130 bar and shape plants, 20 wire and cable plants, 5 galvanized sheet plants, and 2 tinplate plants.

All of Taiwan's many iron and steel facilities are small, which results in high costs. These operate like retail businesses and usually can make ends meet, with some capable of selling abroad. Overall steel consumption has risen sharply, causing imports to increase from $72 million to $157 million and production to grow from approximately 700,000 tons to 1.3 million tons between 1968 and 1971. Specifically, the manufacturing, machinery, and shipping industries have been consuming increasing quantities of steel. These were the underlying reasons prompting the establishment of an integrated steel industry.

NONMETALS

Cement.—The Taiwan cement industry had a good year in 1971; production increased 17 percent to more than 5 million metric tons. Exports during the first 10 months of 1971 were 815,200 tons, 9 percent more than those of 1970. Since South Vietnam was the principal foreign market, there was concern over the long-term prospects for exports there. Also, Taiwan faces more competition in terms of export markets elsewhere, such as South Korea, the Philippines, and Thailand, which themselves have built up surplus cement capacities. However, domestic demand continued its upward trend, with large increases in cement consumption forecast in the areas of large-scale public construction and prefabricated housing. National cement capacity at yearend had already reached 6.5 million metric tons and expansion to 7.8 million tons is expected within two years.

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[3] Industry of Free China (Taipei). The Iron and Steel Industry in Taiwan. February 1972, pp. 6–14.

The Taiwan Cement Corp. (TCC), now privately owned, was rated at 2.6 million tons at yearend, or about two-fifths of the National total. This company has 11 kilns at four locations, including three new ones: a 1,500-metric-ton-per-day suspension preheater kiln at Kaohsiung, a 1,100-metric-ton-per-day kiln of the same type at Suao, and one larger than 1,500-metric-ton-per-day at Chutung. Apparently, TCC does not contemplate further expansion in the next few years.

There were actually 11 other cement plants on Taiwan, all operated under separate management. Second to TCC was Asia Cement Corp. with a 1.7 million-ton plant and four kilns near Hsinchu; the newest kiln was nearly as large as the other three put together. Other sizable plants are located at Tahu, Kangshan, and two at Panpingshan, owned by Universal Cement Co., Chiahsin Cement Co., Chientai Cement Co., and Southeast Cement Corp., respectively. Two other plants will be built up in the next few years, Chengtai Cement Co.'s Panpingshan plant and Yungkang Cement Co.'s Yangmei plant.

Fertilizers.—Taiwan's fertilizer industry underwent little change in capacity during the year. Approximately 15 plants were in existence, with a combined annual capacity of 1.2 million metric tons—including 480,000 metric tons in ammonium sulfate, 300,000 metric tons in urea, and 200,000 metric tons in calcium superphosphate. The Government's Taiwan Fertilizer Co. (TFC) owned more than 50 percent of the plants as well as the overall capacity.

A phosphoric acid plant at Kaohsiung belonging to TFC and an ammonia plant at Nankong owned jointly by TFC, Kaohsiung Ammonium Sulphate Corp., and China Petroleum Corp. (CPC) were among the newer facilities. In spring 1971, following successive seasons of fertilizer oversupply in Taiwan, the Mobile Oil Corp. and the Allied Chemical Corp. were trying to sell their combined 70-percent share of an ammonium-urea complex in Maoli for $12 million. CPC owns the remaining 30 percent, and TFC may wind up buying the foreign shares. Early in 1972 the Lee Chang Yung Chemical Co. was awarded a contract to build a 43,000-ton-per-year methanol plant, utilizing natural gas as feedstock and employing the Lurgi process.

Taiwan has adequate pyrites and some sulfur, but must depend upon imports for almost all of the phosphates and potassic minerals. The United States, which has been the main source of phosphate rock, shipped 119,000 metric tons in 1970 and 96,400 metric tons in 1971 to Taiwan. Trade in chemical fertilizers has not been too important, and exports have declined sharply in recent years.

Marble.—Taiwan's output of 1.51 million metric tons of marble in 1971 represented a 17-percent increase over the previous year. The entire production came from eastern Taiwan near Hualien. More than one-half was produced by the Retired Servicemen's Engineering Agency (RSEA), which operates roughly 10 quarries and many cutting and craft shops. About 140 other small operators produce the rest of Taiwan's marble. Many varieties of high-quality marble are found in a 100-mile stretch of the island. Marble experts[4] place reserves at more than 3 billion tons, ranking Taiwan along with the Philippines and Iran as the three areas with the most promising potential. Costs were low in Taiwan, compared with Italy, for example.

Taiwan has been one of the few marble producing areas in the world where marblecraft outranks structural marble as a market. The pattern is changing, however, as local architects construct more and more highly priced buildings. Meanwhile, the export market has been expanding rapidly, with foreign sales totaling about $500,000 in 1970 and much more in 1971. Sales abroad, mainly to Australia and the United States, are projected to reach $3 million annually during the 1970's.

Salt and Soda.—Taiwan's salt industry has undergone rapid expansion in recent years, with output registering a 40-percent increase in 1970 and another 25-percent increase in 1971 over previous years, to about 670,000 metric tons in 1971. Salt is no longer available for export, and, in fact, there has been a shortage since 1970.

Early in 1972 a tentative agreement was made between the government of Taiwan and the Japanese firms Marubeni Corp.

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[4] Modern Asia (Hong Kong). March 1971, pp. 12–14.

and Asahi Chemical Industry Co. to construct a 100,000-metric-ton-per-year salt plant in Taiwan. The proposed $7 million project would involve construction of sea water intake facilities, a power generation unit, and salt production and packing lines. Start-up for this ion-exchange membrane salt plant is scheduled for late 1972 or early 1973. The bulk of Taiwan's salt is consumed by the soda industry.

Taiwan's 20 alkali-chlorine plants, all employing the electrolysis process, produced approximately 135,000 tons of caustic soda, 51,000 tons of soda ash, and 120,000 tons of chlorine in 1971. The Taiwan Alkali Corp. has three plants; the largest, at Kaohsiung, was rated at 135 tons per day of caustic soda. The Formosa Plastics Corp. has a 110-ton plant. Soda was consumed mainly by the paper, textile, aluminum, and soap industries. Increasing quantities of alkali-chlorine products will be required by the expanding petrochemical industry.

MINERAL FUELS

Coal.—Coal production continued its downward trend with output dropping another 8.6 percent to less than 4.1 million metric tons, or only 90 percent of projected production. The production decline was caused primarily by temporary suspension of operations in major mining areas as a result of severe flood damage during the typhoons of September 1971.

In addition to natural calamities, Taiwan's coal industry was suffering from the long-standing problems of high production costs and declining demand. Coal reserves were increasingly difficult and costly to work, because of depth and distances from the shafts. Mine owners were reluctant to invest in adequate safety measures, and the result was more accidents and less stability in operations. Natural gas and petroleum were cutting into the coal markets in both households and factories. The coal price to state enterprises was kept down and prices in general were too low to allow adequate returns to the coal industry. The flood damages accentuated the difficulties. A long-heralded coal mechanization plan hardly moved ahead at all during 1971, although this was a necessary step to help the coal industry recover. A suggestion was made to collect tax on oil imports to subsidize coal, but this has not yet been taken seriously. The rise in petroleum prices give some hope to coal producers. When an integrated steel industry is eventually established, the good-quality local bituminous coal should find a new market.

Petroleum.—Although output of indigenous crude oil increased by nearly one-fourth during 1971, production continued to be a mere fraction (about 2.5 percent) of all oil imports, which were approximately 33 million barrels valued at $75 million. Most of the crude came from the Middle East, primarily from Iraq. In an effort to lower import costs, a program was proposed to acquire tankers. Meanwhile, the Organization of Petroleum Exporting Countries (OPEC) decided to raise prices. Preliminary statistics show that oil imports rose by about 6 percent in quantity and nearly 20 percent in value in 1971, indicating that costs went up. Oil consumption has been increasing at a rate of nearly 10 percent annually in recent years, and future projections indicate a 15-percent annual rise.

CPC has been the principal entity in all of Taiwan's oil and gas activities, including operation of gas stations. Annual gross has exceeded $250 million, with very high profits. CPC's principal refining center—Kaohsiung—underwent doubling of capacity in 1971, with a new 100,000-barrel-per-day refinery (including a 15,000-barrel-per-day craking plant) approximately equalling the combined capacity of all the older units. Four 100,000-deadweight-ton tankers were operating out of Kaohsiung at yearend. CPC will build a $35 million naphtha cracking plant at Kaohsiung also, scheduled for completion by 1974.

CPC's 100,000-barrel-per-day new refinery in northern Taiwan, along with the necessary offshore discharging facilities for handling 150,000-deadweight-ton tankers, was still in the planning stage at yearend. The site may ultimately be near Shenao, a small northeast coastal port, should the land acquisition difficulties be overcome. Another problem is to secure a foreign loan of about $40 million by early 1972. It was hoped that financing would be settled by mid-1972 so that refinery could be completed by 1975.

CPC works in the petrochemicals field either directly or through its subsidiary, China Petrochemical Development Corp. (CPDC) and affiliates. The CPC naphtha cracking plant will produce about 200,000 tons of ethylene, 100,000 tons of propylene, and 35,000 tons of butadiene each year. CPCC was building a $1.5 million ethane cracking plant based upon natural gas, which is scheduled for completion in 1972. A CPC affiliate, with Gulf Oil Corp. and six other firms, completed a 38,000-ton vinyl chloride monomer plant at Kaohsiung in early 1971, and plans to finish building another such plant—a 60,000-ton plant at Toufen—next year. The USI Chemical Corp. plans to double the capacity of its low-density polyethylene plant at Kaohsiung. When CPC finishes its various refining units, the raw material base for a highly profitable plastics industry will have been established.

The China Gulf Oil Corp., 70 percent U.S. Gulf Oil and 30 percent CPC, which already has a 1,500-barrel-per-day lubricating oil refinery at Tsoying, will finish building a 50-ton-per-day paraffin wax plant by yearend 1972; the corporation also intends to branch into the rubber extension oil field with a 2,000-barrel-per-day plant in mind.

On offshore matters, Senkaku Islands (Tiao-yu-t'ai), about 100 miles north of Taiwan, continued to make news. The Taiwan Government had already granted five concessions to international oil companies, despite objections from both Japan and the Peoples' Republic of China. In view of the circumstances, however, the international oil firms moved cautiously even with regard to general surveys. After being admitted to the United Nations, the Peoples' Republic of China became clearly more vociferous in its claims on the Senkaku Islands and the Continental Shelf in general.

The Mineral Industry of Thailand

By H. B. Wood[1]

Thailand's mineral output showed a 6.3-percent growth in value to reach $114 million[2] in 1971, chiefly as a result of increased fluorspar and tungsten production and a threefold growth in barite output from a small beginning. Thailand's principal mineral industry, tin, maintained its production level but dropped over 9 percent in value. No figures are available for value added from mineral and metal processing. The value of cement output was about one-half the total value of minerals produced. The value-added figures for imported materials such as oil, steel, base metals, and fertilizer products were considerable and have increased in recent years.

The growth of the mining industry during 1971 was about the same as the growth of the gross national product (GNP). Measured in 1970 dollars, Thailand's GNP was $6.91 billion (preliminary) in 1971, compared with $6.51 billion in 1970. The share of mining was less than 2 percent of the GNP, and the share of all mineral industries (including processing) was 3 to 4 percent. Mining products were relatively more important to the economy in other ways. These products contributed about 13 percent to total Thai exports in 1971 and were significant as earners of revenue for the Government. The industry also was an important employer of workers. About 750 mines, employing more than 50,000 workers daily, were operating during 1971. Many were small independent mines that were worked seasonally during favorable weather conditions. Large-scale mining continued to be restricted by the Government regulation requiring majority Thai ownership of mining operations north of the 11th parallel and by the poor road, rail, and port facilities.

The year 1971 marked the end of Thailand's second 5-year plan. Various external events, such as the Vietnam conflict and the readjustment of world currencies, prompted Thailand to immediately adopt the third 5-year plan (1972–76). The new plan prepared by the National Economic Development Board (NEDB) was aimed at improving the Thai economy so that it could resume the 11-percent average growth of the GNP achieved during 1963–69. Growth during 1971 slowed to 6 percent. The role of mining was not overly stressed in the new plan, since Thailand's economy was mainly agricultural; however, emphasis was placed on manufacturing, including mineral processing for domestic consumption. The Government encouraged oil exploration by leasing large tracts to oil companies.

Thai currency remained on parity with U.S. dollars. This meant easier investment by Americans as compared to the Japanese. Investments by seven or more U.S. oil companies were increasing in the petroleum exploration field. Union Carbide Corp. and its partners in Temco (Thailand Exploration and Mining Co., Ltd.) initiated large-scale cutter-suction dredge operations for placer tin, and for exploration for new tin deposits. Phelps Dodge Corp. has a joint venture in copper products, and Thai Zinc Co. Ltd. announced plans to develop its large zinc deposit and to build a large zinc smelter. The United States imported 71 percent of Thailand's tin output. Owing to economic conditions in the United States, this percentage is not expected to increase in 1972.

Japan's investments in Thailand were large, but only a relatively small share of the investments involved minerals. Thailand had more than $300-million trade deficit with Japan in 1971, and both countries and their joint venture firms were trying to reduce this deficit. Japan did not import much tin from Thailand, but obtained the bulk of Thailand's fluorspar. The construction of a fluorspar heavy-media and froth-flotation plant was started in 1971; when the facility is completed it should greatly improve the quality of exportable fluorspar. Most of Thailand's steel imports came from Japan; their value was much greater than the value of minerals exported by Thailand to Japan. The boom in exploration drilling for oil in southeastern Asia, both onshore and offshore, quadrupled the barite production and was a large factor in greatly increasing kaolin clay production (table 1).

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[1] Mining geologist, Division of Nonmetallic Minerals.

[2] Where necessary values have been converted from Thailand bahts (B) to U.S. dollars at the rate of B20.8=US$1.00.

The growth of electrical power in 1961–71 far exceeded gross domestic industrial production. The Electric Generating Authority of Thailand (EGAT) was primarily responsible for the expansion, from 160,000 kilowatts in 1961 to 1,286,500 kilowatts in 1971. A breakdown of installed capacity at the end of 1971 was as follows: hydroelectric 40 percent, thermal plants 44 percent, gas turbines 13 percent, and diesel generators 3 percent.[3]

In December 1971 a farsighted plan to expand electric power distribution was approved by the Asian Development Bank when the bank endorsed a loan of $18 million to Thailand's Metropolitan Electricity Authority (MEA), which is the electrical distribution arm of EGAT. The loan funds were to be used to build transmission lines and substations and to expand the distribution network. This expansion was necessary to meet the electrical power needs, which have grown at the rate of 30 percent per year.[4]

Plans for construction of a nuclear powerplant of 500-megawatt capacity, which were announced in March 1971, were slowed down by the financing programs of the Export-Import Bank of the United States. The new program scheduled the bidding on the plant for August 1974 and completion by 1980.

In September 1971 Thailand's Ministry of National Development announced that eight areas in Losi and Chaiyaphum Provinces were open for application for exploration and mining rights for copper, zinc, lead, gypsum, and rock salt. Although applicants were required to be Thai citizens, a provision was made for consideration of foreigners as "special cases," indicating that the restrictions against non-Thai citizens were softening.

On November 17, 1971, after several internal crises, including terrorist activities in southern and northern Thailand, Field Marshal Thanon Kittikachorn dissolved the Cabinet, abolished Parliament, suspended the Constitution, and set up a revolutionary council called the National Executive Council to rule Thailand.

Late in November 1971 the Thai Government, now represented by the new National Executive Council, approved the 1972 national budget of $1.39 billion for the fiscal year which began October 1, 1971. This budget was only 1.4 percent above the $1.37 billion of that of 1970. The Department of Mineral Resources was allocated $3.8 million to promote mineral exploration and exploitation. This was a 15-percent increase over the 1971 budget.

PRODUCTION

Although mineral prices were generally low during the second half of 1971, overall output increased slightly in terms of value. Estimated mine output value for 1971 was $114 million, a 6.3-percent gain over the value for 1970. This increase parallels Thailand's GNP growth but falls far short of the average increase of 27 percent per year in mineral production during 1962–70.[5]

Tin maintained its position as the leading mineral product, accounting for 65 percent of Thailand's total mine output value. Production of 21,346 long tons of tin-in-concentrates in 1971 was nearly the same as the tonnage in 1970; however, value declined 5.4 percent, to only $74.0 million. Thailand smelts all its tin and continues to be the third largest tin metal producer in the world.

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[3] Modern Asia. Power to the People. March 1972, pp. 14–15.

[4] Asian Development Bank, Philippines. ADB Press Release 44/71, Dec. 2, 1971.

[5] U.S. Embassy, Bangkok, Thailand. Industrial Outlook Report: Minerals. State Department Airgram A-108, Mar. 21, 1972, pp. 1–5.

Fluorspar ranked a strong second in mineral output value, with the average prices rising 45 percent during 1971. Compared with 1970, Thailand's fluorspar production increased 86 percent in value and 34 percent in tonnage, reaching $18.3 million and 427,000 tons, respectively.[6] [7]

Next to fluorspar, tungsten made the second most important contribution to the overall increase in mine output value. Value of tungsten concentrates produced increased 78 percent, reaching $12.3 million in 1971, mostly due to a price increase. The gain in production was significant, tripling during the year.

Barite output quadrupled in both tonnage and value, reaching 63,539 tons and $1.58 million in value in 1971. Increased demand for Thai barite developed as a result of the oil drilling boom in Southeast Asia. No production of barite was reported prior to 1967.

Cement has not been included in the overall mine output value noted above, but production of this mineral commodity also made notable gains. Specifically, cement production increased about 13 percent in tonnage and 9.4 percent in value during the year, attaining the levels of 2.8 million tons and $65.4 million in 1971. There was a modest price increase, from $21.25 per ton in 1970 to $22.14 per ton in 1971.

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[6] All tonnage refers to metric tons unless otherwise designated.

[7] Engineering and Mining Journal. Fluorite Industry Booming in Thailand. June 1971, p. 30.

Table 1.—Thailand: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity[1]	1969	1970	1971[p]
METALS			
Antimony:			
Ore:			
Gross weight	1,560	5,545	5,397
Metal content	750	2,357	2,294
Metal	246	155	86
Chromite	--	--	1,000
Columbite-tantalite concentrates	26	57	42
Iron and steel:			
Iron ore 55 percent iron	477,393	22,523	39,531
Pig iron	11,120	10,812	13,552
Steel ingots and castings	9,391	5,758	119,994
Steel billets	--	--	51,931
Lead, mine output, metal content	1,798	1,289	2,348
Manganese ore:			
Battery grade, 75 percent manganese dioxide	4,226	6,474	5,097
Metallurgical grade, 46–50 percent manganese dioxide	25,595	17,391	8,885
Rare-earth minerals: Monazite	65	108	112
Tin:			
Mine output, metal content ... long tons	[r] 20,785	21,435	21,346
Metal ... do	22,049	21,692	21,336
Tungsten concentrate:			
Gross weight	1,267	1,378	4,864
Metal content	653	710	2,507
Zinc (in lead-zinc ore)[e]	700	500	900
Zircon	250	865	1,526
NONMETALS			
Barite	--	16,490	63,539
Cement, hydraulic ... thousand tons	2,403	2,473	2,786
Clays, kaolin	1,930	2,288	10,133
Fluorspar, 80 to 85 percent calcium fluoride	297,560	318,227	427,298
Gypsum	92,034	144,250	167,903
Marl (used for cement) ... thousand tons	1,534	623	490
Salt, sea 85 to 90 percent sodium chloride.[e] ... do	200	200	160
Sand, silica	NA	43,720	27,440
Talc and related materials: Pyrophyllite	1,982	--	50
MINERAL FUELS AND RELATED MATERIALS			
Coal, lignite	347,811	399,871	445,082
Petroleum:			
Crude ... thousand 42-gallon barrels	16	70	66
Refinery products:			
Gasoline ... do	3,523	4,342	12,521
Kerosine ... do	1,002	1,071	1,139
Jet fuel ... do	1,591	2,092	3,237
Distillate fuel oil ... do	6,471	7,196	11,962
Residual fuel oil ... do	6,375	8,083	11,488
Naphtha ... do	1,358	651	219
Liquefied petroleum gas (LPG) ... do	588	709	1,100

[e] Estimate. [p] Preliminary. [r] Revised.

[1] In addition to the commodities listed, Thailand produces other varieties of crude construction materials (clays, sand and gravel, stone, etc.) but output is not reported quantitatively and available information is inadequate to make reliable estimates of output levels.

Production of refined petroleum products increased 73 per cent in 1971 to 41.7 million barrels, which was made primarily from imported crude oil and semiprocessed oils.

TRADE

The most notable feature of Thailand's foreign trade in 1971 was the country's improved trade balance. Preliminary estimates show that the gap was reduced from $588 million in 1970 to $449 million in 1971. Specifically, 1971 exports totaled $833 million, up 17 percent from 1970. Total imports were $1,288 million in 1971, down 0.8 percent from $1,299 million in 1970.[8] The program to hold down imports and increase exports had succeeded to some extent.

Although two-thirds of Thailand's export earnings were generated by agricultural products, mineral products were also of considerable significance. In 1971, mineral exports represented about one-seventh of total exports, and the value of $109 million was about 5 percent greater than the $103.4 million in 1970.[9] As in past years, tin was the major mineral produced and exported, earning about $75 million in foreign exchange. Tungsten and fluorspar exports grossed about $18 million and $12 million each in 1971, and cement earned approximately $5 million.

Breakdown of 1971 tin exports in terms of quantity shows 71.2 percent going to the United States, 25.8 percent to the Netherlands, and most of the rest to Japan. During the same year, 86 percent of the fluorspar went to Japan and 12 percent went to the Soviet Union. Exports of tungsten concentrates in 1971 showed 38 percent going to West Germany, 18 percent to the United Kingdom, 12 percent to the Netherlands, and 10 percent to Japan.

Minerals and related products were even more important in Thailand's import trade, contributing about one-third of the 1971 total value. Breakdown of mineral import values for the year shows 8.6 percent from chemicals, 5.8 percent from crude oil, 3.1 percent from refined petroleum, 6.2 percent from iron and steel, 3.1 percent from nonferrous metals, 3.6 percent from metal manufactures, and 1.9 percent from fertilizers and pesticides. In terms of dollar values, imports of petroleum amounted to about $114 million in 1971 ($104 million in 1970) imports of chemicals $110 million, and imports of base metals $91 million. The nature of oil imports has changed owing to expansion of refining facilities. In 1970, one-half of the oil import value was in the crude form, and in 1971, about two-thirds.

On June 9, 1971, the Director-General of the foreign trade department announced that new trade agreements had been signed with Bulgaria and the Soviet Union. As a result the Soviet Union will buy fluorite of specific quality from Thailand on a government-to-government basis over a 5-year period in addition to providing sea transportation. Bulgaria and Romania agreed to buy produce. This government-to-government transaction was a new approach for Thailand.

The Thai Government had previously announced on March 12, 1971, (A-106) that effective January 1, 1970, the Brussels Tariff Nomenclature had been adopted and would replace the previously used Standard International Trade Classification. The Nov. 3, 1971 Airgram A-456 shows both the BTN and SITC for comparison.[10]

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[8] Annual Economic Report 1971. Bank of Thailand, pp. 44–45.

[9] U.S. Embassy, Bangkok Thailand. Industrial Outlook Report: Minerals, table 3. State Department Airgram A–108, Mar. 21, 1972.

[10] U.S. Embassy, Bangkok, Thailand. Petroleum, Foreign Trade in Refined Products, Thailand, 1970. State Department Airgram A–456, Nov. 3, 1971.

Table 2.—Thailand: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum metal including alloys:		
Scrap	682	403
Unwrought	100	--
Semimanufactures	11	36
Antimony, ore and concentrate	1,355	--
Chromium, chromite	--	200
Copper:		
Ore and concentrate	--	25
Metal including alloys, scrap	230	240
Iron and steel:		
Ore and concentrate	[1]496,840	52,335
Metal:		
Scrap	88	--
Pig iron including cast iron	--	800
Semimanufactures	9,344	11,584
Lead:		
Ore and concentrate	3,511	3,366
Metal, including alloys:		
Scrap	--	844
Unwrought	208	169
Semimanufactures	1	101
Magnesium metal including alloys, scrap	--	10
Manganese, ore and concentrate	17,917	7,068
Tin metal including alloys, unwrought ... long tons	24,188	21,502
Tungsten, ore and concentrate	569	1,151
Zinc metal including alloys, semimanufactures	65	737
Zirconium, ore and concentrate	--	1,960
Other, metallic ores and concentrates	1,279	11,269
NONMETALS		
Cement	95,491	150,821
Clays and products, Fuller's earth, dinas, chamotte and other	--	5
Fertilizer materials, crude, phosphatic	546	176
Fluorspar	157,962	349,257
Gypsum	31,188	37,904
Lime	83	--
Precious and semiprecious stones, except diamond:		
Natural ... thousand carats	8,075	7,486
Manufactured ... do	--	2,417
Salt	123,981	96,272
Silver, metal including alloys ... troy ounces	--	643
Stone, sand and gravel:		
Dimension stone, crude and partly worked, calcareous	10	5
Gravel and crushed rock	164	46
Limestone	--	194
Other:		
Minerals, crude, n.e.s	160,502	NA
Slag, dross and similar waste, not metal bearing:		
From iron and steel manufacture	--	935
Slag and ash, n.e.s	2,473	1,574
MINERAL FUELS AND RELATED MATERIALS		
Petroleum refinery products:		
Gasoline, motor [2] ... thousand 42-gallon barrels	160	558
Kerosine [2] ... do	4	334
Jet fuel ... do	2	3
Distillate fuel oil ... do	23	157
Lubricants [2] ... do	1	12
Other ... do	317	4

NA Not available.

[1] Includes roasted iron pyrites.

[2] Includes bunker.

Table 3.—Thailand: Exports of selected mineral commodities, 1971 [p]

(Metric tons unless otherwise specified)

Commodity	Quantity	Value (millions)
METALS		
Antimony ore and metal	4,612	$1.24
Iron ore	4,500	.03
Lead ore	5,180	.59
Manganese ore, all grades	8,279	.17
Tin metal ... long tons	21,358	75.07
Tungsten concentrate	4,384	15.26
NONMETALS		
Fluorspar	346,782	14.90
Gypsum	20,500	.22
Salt	[1] 36,561	.63
Cement	257,809	6.05
Barite	37,700	.92
Kaolin	4,400	.12

[p] Preliminary.
[1] 9 months only.

Source: U.S. Embassy, Bangkok, Thailand. Industrial Outlook Report: Minerals. State Department Airgram, A-138, Apr. 1, 1971, pp. 1–5, Airgram A-108, Mar. 21, 1972.

Table 4.—Thailand: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum:		
Bauxite and concentrate	3,381	2,992
Metal including alloys:		
Scrap	59	1,081
Unwrought	5,986	8,423
Semimanufactures	4,476	4,581
Antimony:		
Ore and concentrate	13	2
Metal, including alloys, all forms	13	14
Arsenic trioxide, pentoxide, and acids	NA	109
Chromite	NA	20
Cobalt oxides and hydroxides	NA	105
Copper:		
Matte	NA	12
Copper sulfate	58	50
Metal, including alloys:		
Scrap	56	133
Unwrought	487	10
Master alloys	NA	94
Semimanufactures	4,336	4,255
Gold metal, unworked or partly worked ... troy ounces	NA	146,223
Iron and steel:		
Ore and concentrate	137	244
Metal:		
Scrap	129,195	168,996
Pig iron, ferroalloys, and similar materials	4,711	4,941
Sponge iron, powder, and shot	NA	1,329
Steel, primary forms	9,478	7,263
Semimanufactures	616,705	501,230
Ingots	NA	171
Lead:		
Oxide	449	628
Metal including alloys:		
Scrap	108	87
Unwrought	2,801	2,770
Semimanufactures	291	213
Magnesium metal including alloys:		
Scrap	108	87
Unwrought	2,801	2,770
Manganese:		
Ore and concentrate	256	370
Oxides	638	464
Mercury ... 76-pound flasks	6,989	128
Molybdenum metal including alloys, all forms	NA	5
Nickel:		
Ore and concentrate	--	2
Matte, speiss, and similar materials	8	2
Metal, including alloys:		
Scrap	2	1
Unwrought	3	6
Semimanufactures	274	540

See footnotes at end of table.

Table 4.—Thailand: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS—Continued		
Platinum-group metals:		
Ore and concentrate troy ounces	4,726	778,047
Metals including alloys, all forms do		98,156
Silver:		
Waste and sweepings do	4,372	--
Metal including alloys do	27,392	16,590
Tin:		
Oxides long tons	--	3
Unwrought and semimanufactures do	11	2
Titanium:		
Ore and concentrate	108	148
Oxides	--	222
Tungsten metal including alloys, all forms	--	5
Zinc:		
Ore and concentrate	--	4
Oxide	902	1,331
Metal including alloys:		
Scrap	1,043	370
Blue powder	--	20
Unwrought	18,071	16,361
Semimanufactures	1,911	12,308
Zirconium, ore and concentrate	--	102
Other:		
Ore and concentrate of base metals, n.e.s	575	392
Ash and residue containing nonferrous metals	3	73
Oxides, hydroxides, and peroxides of metals, n.e.s	--	64
Metals including alloys, all forms:		
Alkali, alkaline earth and rare-earth metals	--	7
Pyrophoric alloys	--	16
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc.	1,259	1,717
Dust and powder of precious and semiprecious stones	--	57
Grinding and polishing wheels and stones	638	1,179
Asbestos	24,504	21,271
Barite and witherite	18	84
Bromine:		
Elemental	11	--
Compounds, n.e.s	118	--
Cement	39,768	21,295
Chalk	8	52
Clays and products:		
Crude, n.e.s.:		
Fuller's earth, dinas, and chamotte	--	1,715
Kaolin	7,485	6,026
Andalusite, kyanite, and sillimanite	693	--
Products:		
Refractory (including nonclay bricks)	13,906	8,782
Nonrefractory	r 21,380	13,042
Cryolite and chiolite	3	10
Diamond:		
Gem, not set or strung carats	33,567	10,741
Industrial do	10,105	38,093
Diatomite and other infusorial earths	123	47
Feldspar, leucite, nepheline, and nepheline syenite	762	1,455
Fertilizer materials:		
Crude and manufactured:		
Nitrogenous	25,781	11,812
Phosphatic	125,754	6,351
Potassic	2,950	3,760
Mixed	111,346	227,692
Ammonia	919	--
Fluorspar	--	85
Graphite, natural	1,006	774
Gypsum, anhydrite, and plasters	214	647
Iodine	3	--
Lime	199	429
Magnesite	368	339
Mica	38	10
Pigments, mineral including processed iron oxides	11	783
Precious and semiprecious stone, except diamond thousand carats	37,318	29,471
Pyrite (gross weight)	--	120
Salt	213	120
Sodium and potassium compounds, n.e.s	--	5,645
Stone, sand and gravel:		
Dimension stone:		
Crude:		
Calcareous (marble)	6,446	99
Slate		3
Other		3,753

See footnotes at end of table.

Table 4.—Thailand: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970
NONMETALS—Continued		
Stone, sand and gravel—Continued		
Dimension stone—Continued		
Worked:		
Calcareous (marble)	1,162	1,108
Slate		65
Paving and flagstone		18
Other		345
Dolomite, chiefly refractory grade	4	1
Gravel and crushed rock	540	5,542
Limestone (except dimension)	376	147
Quartz and quartzite	1,982	1,274
Sand excluding metal bearing	265	191
Sulfur:		
Elemental:		
Other than colloidal	12,029	23,470
Colloidal	55	1,392
Sulfur dioxide	--	15
Sulfuric acid	92	20
Talc and steatite	2,727	3,196
Other nonmetals, n.e.s.:		
Crude	572	NA
Slag, dross, and similar waste, not metal bearing	742	1,898
Oxides and hydroxides of magnesium, strontium, and barium	--	41
Building materials of asphalt, asbestos and fiber, cement and unfired nonmetals, n.e.s	3,787	NA
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	20	29
Carbon black	5,079	6,801
Coal, all grades, including briquets	163	287
Coke and semicoke	10,133	9,783
Peat	--	3
Petroleum:		
Crude and partly refined:		
Crude thousand 42-gallon barrels	18,160	17,223
Partly refined do	--	24,080
Refinery products:		
Gasoline, aviation do	74	43
Gasoline, motor do	1,218	1,320
Kerosine do	194	337
Jet fuel do	401	453
Distillate fuel oil do	7,496	6,254
Residual fuel oil do	1,473	882
Lubricants do	703	755
Mineral jelly and wax do	48	50
Other:		
Nonlubricating oils, n.e.s do	--	148
Liquefied petroleum gas do	59	2
Pitch and pitch coke do	379	2
Bitumen and other do		5
Bituminous mixtures, n.e.s do		10
Other do		325
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	--	1,816

r Revised. NA Not available.

COMMODITY REVIEW

METALS

Antimony.—Antimony ore production decreased about 2.7 percent, dropping to 5,397 metric tons in 1971. Antimony exports of 4,612 tons were about the same as that of 1970; however, value of exports dropped drastically from $5.36 million in 1970 to $1.24 million in 1971. Because sharp price changes are characteristic of antimony, miners hesitate to modernize and enlarge production facilities.

Chromite.—Production of 1,000 tons of chromite ore was reported for 1971. This is the first chromite production reported since 1967.

Copper.—After more than 2 years of effort and expense, the Hawaii-based Dillingham Corp. and Signal Oil Co. abandoned plans for a copper mining and smelting project in Loei Province in northern Thailand. The failure of their Thai partner to raise the necessary capital and the Thai Government's regulations requiring majority Thai ownership of mining operations north of the 11th parallel probably contributed to the abandonment of the project.

Iron Ore.—The 1971 production of iron ore exceeded 1970 production by 17,000 tons a 75 percent increase. Iron ore occurs in many areas, and recently new deposits were reportedly discovered in Petchabun Province. The May 1972 investor[11] reports Thailand's known iron ore reserves to be 85 million tons, of which 35 million tons are controlled by Siam Cement Co., Ltd., and 50 million by the Thailand Steel Co., Ltd.

Iron and Steel.—Steel ingot production in Thailand totaled about 120,000 tons in 1971; the country's plant capacity is 326,000 tons.[12] Steel facilities were expanded considerably in 1970 and 1971, and by the end of 1971, 11 steelmakers were operating but well below capacity. Thailand's steel industry, headed by G. S. Steel Co., Ltd., and Siam Iron and Steel Co., Ltd., depends mainly on imported metal scrap and semimanufactures for raw materials.

In late 1971 Thai Metallurgical Industries Co., Ltd., of Bangkok received preliminary approval from the Board of Investment of Thailand to construct an integrated iron and steel plant. According to the firm's plans, the proposed mill could eventually involve an investment of over $500 million. Development will be in five stages, starting in 1976 and running through 1985. The plans call for an annual capacity of 500,000 tons of cold-rolled steel, an associated hot-rolled-steel mill, and a 1-million-ton blast furnace.[13]

The optimistic plans for expanding the steel industry are not supported by many local bankers and economists. These opposing factions claim that steel consumption does not warrant this importance, that the local tax structure is a deterrent, and that further expansion is not warranted until the export market can absorb the overcapacity.

Lead and Zinc.—Lead ore production increased about 45 percent, rising to 5,525 metric tons in 1971. The Kanchanaburi lead district in northwestern Thailand continued to be the main lead producing area. Production is expected to continue at approximately the same rate in 1972.

No production of zinc concentrate or ore was reported for 1970 or 1971. In 1970, Thailand imported 30,370 tons of zinc oxide, zinc metal alloys in scrap, unwrought zinc, and zinc semimanufactures. A growing domestic market exists in Thailand for such products.

The large zinc deposit in the Mae Sod district of northwest Thailand is a somewhat recent discovery. In September 1971, the deposit was reported to contain 3 million tons of ore with an average zinc content of 35 percent. The principle mineral is smithsonite.[14]

The concession area in Mae Sod, which was held briefly by the National Lead Co., was leased by the Thai Government to Thai Zinc Ltd. in December 1971. Three U.S. firms, Atlantic Oil Corp., Basic Earth Science Systems Inc. and Susa Corp., will back Thai Zinc in a proposed $20 million mining and smelting project. An Australian firm, Davy-Ashmore Pty., Ltd., will design and build a 50,000-ton-per-year zinc smelter. Output will go mostly to Japan.[15] No zinc production is anticipated for 1972, but good access roads exist in the area, which may facilitate exploration and development and result in some zinc production in 1973.

Manganese.—Production of both metallurgical- and battery-grade manganese ores continued their downward trends. Metallurgical manganese output dropped from 17,391 tons in 1970 to 8,885 tons in 1971, and battery manganese, from 6,474 tons to 5,097 tons. The export market for manganese continued strong, increasing about 5.3 percent, from 7,068 tons in 1970 to 8,279 tons in 1971. Most of the exported manganese goes to Japan. There is a local demand for battery-grade ores containing 75 percent manganese dioxide.

Manganese mining methods and equipment in Lamphum Province were similar to fluorspar operations in the same area. Thai Rocks and Minerals Ltd. produced a battery-grade product from ores ranging in grade between 40 and 80 percent pyrolusite. By blending, a shipping-grade product analyzing 75 percent MnO_2 was obtained, which yielded a return of $75 per ton f.o.b. Bangkok at yearend 1971. The ore was broken with pavement breakers, trucked to the sorting area, washed in concrete mixers for 10 to 12 minutes to remove earth, and then dried in the open air. The dried material was screen-sized by hand and by jig, and the fines were washed in a sluice.

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[11] Investor (Siam Publications Ltd., Bangkok). Hard Times for Thai Steel. V. 4, No. 5, May 1972, pp. 285–288.

[12] Work cited in footnote 11.

[13] U.S. Bureau of Mines. Thailand. Mineral Trade Notes, v. 69, No. 1, January 1972, pp. 27–28.

[14] World Mining. Asia—Thailand. V. 7, No. 10, September 1971, p. 67.

[15] Engineering and Mining Journal. Thailand, New Briefs, May 1972. V. 173, No. 5, p. 124.

Tin.—Thailand's tin output, third in the world, showed little change from that of 1970. The 21,346 long tons of mine tin produced was about a ninth of the world total. Export controls by the International Tin Council were dropped in 1970, but tin exports from Thailand (about 21,358 tons in 1971) remained at the same level as in 1970 (21,502 tons). A drop in the world market price for tin metal contributed to the decline in export receipts from $77.8 million in 1970 to $75 million in 1971.

The tin-mining industry was expected to undergo a major technological transformation over the next few years, but production was not expected to drop drastically. The fourth International Tin Agreement went into effect in July 1971, and Thailand fully supports the agreement.

Thailand has produced and exported tin from the area around Phuket Island for more than 1,000 years. There were over 400 tin mines on Phuket, the only island Province of Thailand. These mines were gradually being worked out, although miners found it profitable to rework old tailings, some of which were being washed for the fourth or fifth time. New deposits for onshore mining were mostly found in mainland Provinces, where another 200 mines and mining companies were located. The main interest in 1971, however, was in offshore tin mining with floating dredges. A number of international companies obtained offshore concessions, both in the sea around Phuket and off the mainland Provinces of Ranong and Phangnga, and exploration was being actively pursued.

The largest U.S. firm with interests in Thai tin is Union Carbide Corp., which operated in the Phuket area through two subsidiaries, Thailand Exploration and Mining Co., Ltd. Temco, and Thailand Smelting and Refining Co., Ltd. (Thaisarco). The latter company, in partnership with N.V. Billiton Maatschappij of the Netherlands, operated the only tin smelter in Thailand, which was the fourth largest in the world. Under the terms of the Thaisarco monopoly, all the tin mined in Thailand was to be refined at the Phuket smelter where cash was to be paid on delivery of the ore or within 2 weeks of delivery. This arrangement gave the seller some advantage in the fluctuating world market. The smelter could produce about 100 tons of tin metal per day, but ore deliveries in mid-1971 permitted an output of only 60 to 70 tons per day.

The Temco II dredge, claimed to be the largest cutter suction tin dredge ever built, arrived in Thailand near Phuket in preparation for the start of offshore dredging before the end of 1971. The dredge will operate 24 hours per day with a constant on-board crew of 74 men to handle 5 million cubic yards per year.

Efforts to achieve better coordination among the various Thai Government agencies concerned with the tin-mining industry were made during the year. A new organization known as the Committee of Mining Industry Development was formed to foster the sort of coordination within industry which has heretofore been lacking and to promote the progress of the industry to achieve its full export potential.

The United States remains the largest customer for Thai tin. In 1971, out of the 21,358 tons of tin metal exported 15,208 tons went to the United States, 5,524 tons went to the Netherlands, and 612 tons went to Japan.[16]

Tungsten.—Production of tungsten (wolfram) concentrates (65 percent WO_3) increased threefold, from 400 tons in 1960 to about 1,400 tons in 1970, and then more than tripled again in 1971 to 4,864 tons. New road construction in 1971 in northwestern Thailand near the Burma border will be of further help to the tungsten miners.

In 1971, Thailand exported 1,470 tons of contained tungsten, including 560 tons to West Germany, 267 tons to the United Kingdom, 173 tons to the Netherlands, and 142 tons to Japan.

Tungsten ore was mined directly at 10 different mines and was a byproduct of many tin-tungsten operations located in 16 Thai Provinces. Most of the production came from the Kanchanaburi district in northwestern Thailand. The Nakhon Si Thammarat district in the southern peninsula ranked next.

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[16] U.S. Embassy, Bangkok, Thailand. Sales of Thai Fluorite and Tin. State Department Airgram A-170, May 9, 1972.

The recent discovery of two new deposits contributed significantly to Thailand's sudden rise to about seventh position among world tungsten producers. These deposits, located in the southern Thai peninsula, were reported to be quite extensive and to be already allowing many little operators to gouge out a living by open pit mining. The subsurface potential at the Khao Soon deposit is unknown, but the grade and occurrence indicate that a large deposit may have been uncovered. The other new deposit, which appeared to have a good potential, was located to the west of the Khao Soon deposit and in the center of the Isthmus of Kra.

NONMETALS

Barite.—Barite production in 1971 increased more than threefold over that of 1970. Demand was stimulated by the oil drilling boom in the Southeast Asia area. Most of the barite was shipped to IMC Drilling Mud Inc. in Singapore for grinding to make drilling mud. In 1970 it was reported that construction had started by the Barite Thailand Co., Ltd., on the country's first barite-processing plant in the Province of Songkhla. Thailand's major barite deposits are also located in the southern Province of Songkhla near Malaysia.

Dresser International was in the process of developing a new mine near Tha Sala on the eastern coast of the southern peninsula, with the intention of shipping the barite to a grinding plant near Singapore.[17] The oil drilling boom mentioned above is expected to continue, and Thailand's barite output might well increase further if additional reserves are uncovered.

Thailand exported 37,700 tons of barite, 60 percent of the total 1971 production.

Cement and Marl.—In Thailand portland cement is made from a mixture of limestone and marl which is rich in calcite, clay, and silica. The mixture of specific proportions is ground, burned, and clinkered. In 1971 about 490,000 tons of marl was mined for the cement industry in Thailand. Cement production increased about 12 percent to 2.8 million tons in 1971. Domestic sales increased about 5 percent in 1971. A significant growth occurred in export sales, which increased 77 percent. The average price of cement rose from $21.25 per ton in 1970 to $22.14 per ton in 1971.

In May 1971 Jalaprathan Cement Co. Ltd., in which Kaiser Cement & Gypsum Corp. had a 35 percent interest, started operation of its 530,000-ton annual capacity Cha-Am plant located south of Bangkok near Petchaburi. The company's plant at Takli has an annual capacity of 475,000 tons. In December 1971 Siam Cement Co. Ltd., the country's largest cement producer, shipped cement from its new plant at Kaeng Khoi, 129 kilometers north of Bangkok. This fully computerized plant with an annual capacity of 750,000 tons brought the company's total capacity to nearly 3 million tons per year. Siam Cement Co. started production of white cement at its Bangsue plant (on the outskirts of Bangkok) with a daily capacity of 75 tons. The only other white cement producer was Universal White Cement Co. Ltd., which started production in 1970 from its 32,000 ton per year plant in Saraburi.

The three new installations mentioned (Kaeng Khoi, Cha-Am, and Saraburi) were expected to create a surplus in the domestic market for at least the next 2 years. When the new plants were planned in 1967 and 1968, the demand for cement was high as the result of military purchases by the United States and a general upsurge in construction throughout the country. At that time, the growth of the market during the 1970's was forecast at 20 percent per year. Instead, U.S. purchases declined and the construction industry has been depressed, so that demand has grown by only 5 or 6 percent annually over the past 4 years. The producers expected the market to improve; however, in the meantime, they were making plans to export as much of their surplus as possible to other countries in the area.[18]

Fluorspar.—In 1971 fluorspar or fluorite production rose by some 34 percent to 427,298 tons, but prices, which depend heavily on Japanese demand, fell sharply in the second half of the year. Large surpluses accumulated and production had to be cut back at yearend. It was thought that the Soviets would remedy the situation with purchases of 100,000 tons or more, but they bought only 43,000 tons. The price of metallurgical-grade fluorite fell from $47 per ton in May to $35 per ton in December. The Government and the Thai Fluorite Miners' Association tried to halt the price decline by organizing a fluorite marketing cooperative for all sellers, but failed because most of the miners were too deeply committed to long-term sales contracts to participate.

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[17] Mining Engineering. Thailand. January 1972, p. 34.

[18] U.S. Embassy, Bangkok, Thailand. Thailand's Production and Sales of Cement in 1971. State Department Airgram A-62, Feb. 15, 1972, pp. 1-5.

Improvement in Thailand's fluorspar trade may come instead from the production side. Until now Thailand has exported only raw ore. Last year the Government awarded special promotional incentives to projects that will become Thailand's first two fluorite-beneficiating plants. One, a Thai venture to be built by Universal Mining Co., will operate a British-equipped plant to produce refined metallurgical ore. The second, Thai Fluorite Processing Co., Ltd., owned 40 percent by Kaiser Cement Co. and 60 percent by Thai partners, was building a froth flotation plant. The $1.2 million worth of flotation equipment was supplied by the Joy Manufacturing Co. The plant, located in Petchaburi Province, was scheduled for completion by July 1972. This will be the first plant in Southeast Asia to produce acid-grade fluorite.[19]

Although prices were down in 1971, total fluorspar exports increased slightly, as shown in table 5.

Table 5.—Fluorite: Exports by country of destination [1]

(Metric tons)

Destination	1970	1971
Australia	40	125
Hong Kong	200	10
India	2,229	988
Japan	291,694	297,897
Malaysia	750	700
Netherlands	19,806	1,430
Philippines	--	260
Singapore	480	--
Taiwan	1,980	2,400
U.S.S.R.	22,520	42,971
United States	--	1
West Germany	900	--
Total	340,599	346,782

[1] U.S. Embassy, Bangkok, Thailand. Sales of Thai Fluorite and Tin. State Department Airgram A–170, May 9, 1972.

Fluorspar mining has in recent years become an important extractive industry in Thailand. Production of the mineral, encouraged by export prospects, showed a market increase over the past few years. Most of Thailand's known fluorspar deposits are located in the northern and central regions. In 1971 there were about 70 operating mines in Lamphun, Lampang, Chiang Mai, Mae Hong Son, Tak and Phrae Provinces in the north; Ratchaburi, Petchaburi, and Kanchanaburi Provinces in the central region; and Surat Thani Province in the south. The most productive mines, however, were in the northern Provinces, which contribute between 80 and 95 percent of the total fluorite output. Of the 17 Thai companies engaged in fluorspar mining, the five largest companies accounted for 65 percent of the production. There has been no large-scale systematic fluorspar prospecting program in Thailand, and no one really knows the extent of the reserves. A conservative estimate of 5 to 10 million tons has been reported.

So far, almost the entire output of Thai fluorspar has been of metallurgical grade. The miners try to keep the CaF_2 content at 80 percent for the foreign market, but find it difficult to maintain this grade with their crude sorting methods. However, the future foreign market for fluorspar should improve with the establishment of the two concentrating plants mentioned previously.

It was expected that the Thai industry's production, quality control, and transportation problems would be overcome by the Thai Government's new policy of releasing more areas for mining and of improving the roads in the mining districts, and by the Thai industry's action to build a heavy media and a froth flotation plant.

The Japanese market has been the big outlet for most of Thailand's fluorspar, and in 1971, 86 percent of Thailand's exports went to Japan. In recent years the Thai have made a concerted effort to develop new markets with some success. It is quite possible that Australia, Malaysia, the Philippines, Taiwan, and the Soviet Union will expand their purchases in the near future. Continued growth is anticipated for the fluorspar mining industry depending on future demand, but the growth rate may not be as high as it was in the past 10 years.

Gypsum.—Gypsum production paralleled the building boom in Thailand and increased about 17 percent in 1971, reaching

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[19] U.S. Embassy, Bangkok, Thailand. Minerals. State Department, Airgram A–108, Mar. 21, 1972, p. 2.

167,903 tons. Gypsum exports dropped sharply in 1971, to meet the needs of the domestic market. Thailand's gypsum producers predicted that both domestic and foreign demand would increase steadily in the near future. Gypsum resources in Thailand are extensive and would not be a limiting growth factor.

Salt.—Salt production has been fairly steady since 1968, ranging between 150,000 and 200,000 tons per year. With a buildup of the petrochemical and other chemical industries in Thailand, a steady increase in demand was anticipated. According to a notice in the Bangkok Post large rock salt deposits with sufficient reserves for possibly 200 years were discovered in the northeastern Province of Chaiyabhum. The exploitability of these deposits was confirmed in 1971 by an investigating team of Romanians accompanied by officials of the Thai Mineral Resources Department.

MINERAL FUELS

Coal.—*Lignite.*—Production of lignite increased more than 11 percent, to 445,000 tons in 1971. One of the two existing mines (Krabi) provided cheap fuel to a 60,000-kilowatt powerplant on the southern peninsula. The other mine (Mae Moh) in the north supported both a powerplant and a fertilizer plant, and also produced about 700,000 tons of wood charcoal annually for ironmaking. Both of the lignite-fired powerplants were under the control of EGAT.

Petroleum.—More than 99 percent of Thailand's oil requirements have been met by imports. Production of natural crude oil by the Defense Energy Department (DED), at Fang field in northern Thailand was only 64,000 barrels in 1971, and domestic shale oil was still considered too expensive to develop. However, a great push has recently been made in oil exploration, particularly offshore by international oil companies.

Both crude and refined petroleum were imported, and the pattern has been changing. Combined imports were valued at approximately $104 million in 1970 and $114 million in 1971. In 1970 crude imports (including partly refined oil) amounted to 41.3 million barrels and refined products, to 10 million barrels roughly. In 1971 crude oil imports jumped to 31 million barrels, and refined oil imports declined to 6.6 million barrels.[20] The changeover from importing less refined oil to importing more crude oil simply reflects Thailand's efforts to expand refinery capacity and cut down on foreign exchange needs.

In April 1972 Thailand had the following refineries and capacities: The Fang oil refinery in northeastern Thailand owned and operated by the DED and capable of refining 1,000 barrels per day; the Bangkok oil refinery, owned by DED and under lease to Summit Industrial Corp., capable of refining 65,000 barrels per day; the TORC refinery, owned and operated by the Thai Oil Refinery Company Ltd. (TORC), capable of refining 65,000 barrels per day; and the Esso petroleum refinery, owned and operated by Esso Standard Thailand Ltd., capable of refining 35,000 barrels per day. The Esso refinery is predominantly an asphalt plant. Altogether the petroleum industry had a refining capacity of 166,000 barrels per day in early 1972.[21]

Ministerial regulations necessary to implement the new Petroleum Act and Petroleum Income Tax Act, which became effective in April 1971, were issued. The regulations set forth and make official the rules and conditions under which oil companies will be required to operate. The regulations also outline the procedures to be followed in applying for petroleum exploration and operation concessions—a necessary preliminary to the Government's invitation for additional applications which was announced September 13, 1971.[22]

On October 26, 1971, some 20 companies submitted bids for eight exploration and operation concessions offshore in the Gulf of Thailand and in the Andaman Sea and onshore in northwest Thailand. All seven offshore blocks and the one onshore block were awarded to U.S. companies. The decision as to who will be awarded the two remaining offshore blocks in the Andaman Sea was still under consideration at yearend. The following companies were awarded leases at the October 26 bidding: Triton Oil and Gas Corp.—Blocks 18 and 19 in the Gulf of Thailand, and blocks

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[20] U.S. Embassy, Bangkok, Thailand. Petroleum, Foreign Trade. State Department, Airgram A-198, June 6, 1972, pp. 1-3.

[21] U.S. Embassy, Bangkok, Thailand. Bangkok Oil Refinery Inaugurates New Plant. State Department Airgram A-154, May 1, 1972, pp. 1-4.

[22] U.S. Embassy, Bangkok, Thailand. Petroleum Thai Government. State Department Airgram A-396, Sept. 23, 1971, pp. 1-4.

W-5 and W-6 in the Andaman Sea; Amoco Thailand Co.—Block W-2 in the Andaman Sea; Pan Ocean Oil Co.—Block W-4 in the Andaman Sea; Meridian Oil Co.—the Baen Kaong onshore area of Ubon Ratchanti Province.

Union Oil, Continental Oil Co., British Petroleum Co., Ltd., and Tenneco Oil Inc. held leases on Thailand oil blocks that were obtained from previous applications but were required to go through the formality of reapplying in order to comply to the new Petroleum Act.[23]

In 1971 wildcat oil drilling commenced in earnest on a few onshore and offshore tracts. In June 1971 Continental Oil Co. spudded in a test well in the southern Gulf of Thailand about 130 kilometers east of Phangan Island. On September 23, 1971, the well was bottomed at 9,629 feet and abandoned as a no-show test.

On November 13, 1971, Union Oil commenced drilling its first exploratory well in northeastern Thailand; by December 30, the well had reached a depth of around 5,600 feet.[24] After reaching a depth of 11,000 feet in May 1972, Union Oil abandoned this test well, which was declared a no-show test. Union Oil moved the drill rig out of the area, and commenced seismic work at another onshore area. They also reported plans to drill on their offshore concession in the Gulf of Thailand before the end of 1972.

Availability of drilling rigs appeared to be the main holdup in drilling in the Gulf of Thailand. A shortage of drilling rigs and supplies of pipe may become even more critical when exploration commences around Cambodia and Vietnam.

Expansion of the petrochemical industry in Thailand was being pushed by the Thai Government. They envisage a chemical complex of upstream and downstream plants to be located close to each other in Chon Buri Province near existing oil refineries. A saving to Thailand of some $45 to $60 million annually in imports was estimated once the plants are in operation. On July 23, 1971, the Thai Government and Thai Petrochemical Co., Ltd., representing the Royal Dutch Group, signed a joint venture agreement which provides for the establishment of a $135 million upstream petrochemical plant. Discussions were held between the Thai Government and Japanese interests with regard to building downstream plants.

In June 1971 the National Energy Authority (NEA) announced plans to build a deep-sea pontoon terminal for unloading oil tankers of up to 200,000 tons. This pontoon terminal is to be built on the east side of the Isthmus of Kra near Sri Racha and only a short pipeline distance to the Thai oil refinery. The NEA also proposed an oil pipeline to be built from Sri Racha to Korat in northeast Thailand.[25]

A proposal to build an oil pipeline across the 95 miles of the southern Thailand Isthmus of Kra received renewed interest from the Thai Government and Japanese oil interests. Japanese engineers have been surveying the possible routes from the Sea of Andaman to the Gulf of Thailand. Because Japanese oil fleets have increased tanker sizes to between 200,000 and 500,000 deadweight tons, a search for an adequate and safe alternate route to the hazardous Malacca Straits needs to be found. Larger ships will have to follow a new route from the Middle East to Japan, some 2,200 miles longer, or the oil may possibly be piped across the Isthmus of Kra and then transported in smaller tankers to Japan. No action on the pipeline is anticipated until the major drilling programs off the coast of Southeast Asia and around Indonesia have been completed. Oil discoveries around the islands would reduce the pressure for building a pipeline.[26]

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[23] U.S. Embassy, Bangkok, Thailand. Petroleum. State Department Airgram A-493, Nov. 17, 1971, 3 pp.

[24] U.S. Embassy, Bangkok, Petroleum-Union Oil, State Department Airgram A-163, May 8, 1972.

[25] U.S. Embassy, Bangkok, Thailand. Deep Sea Project. State Department Airgram A-264, June 30, 1971.

[26] Far Eastern Economic Review (Hong Kong). Thailand's Oil Pipelines. Jan. 8, 1972, pp. 29-31.

The Mineral Industry of Tunisia

By Roland W. Merwin[1]

Tunisia's gross domestic product (GDP) was approximately $1,443 million,[2] an increase of 16.8 percent over that of 1970. The mineral share of GDP was about 8 percent of the 1971 total. Not only is this mineral segment significant by world standards, but it is of particular importance to Tunisia as a source of foreign exchange. The crude petroleum sector of the 1971 GDP was valued at approximately $75 million; phosphate rock at approximately $25 million; and other minerals, including fluorspar, iron ore, lead, mercury, salt, and zinc at approximately $15 million. Most of Tunisia's mineral products were exported, as in the past. However, some nonmetallics like cement, lime, clays, salt, and petroleum products were locally consumed.

The petroleum industry continued to be the most important sector of the mineral industry, as to both present output and prospects for the future. Production decreased somewhat and exports increased slightly, with almost the entire source of crude being the El Borma field. Two new major fields were discovered, one onshore and one offshore, near the southeastern coast in the Sfax area. These two fields were expected to increase total production by more than one-third when brought into operation. Numerous new exploration permits have been granted as a result of promising geological indications and the favorable attitude of the Government. Such permits, new and old, covered virtually all of the waters offshore and two-thirds of the country's land area.

The Government of Tunisia continued to regard the revitalization of the phosphate industry as one of its most important objectives. Such revitalization would be of economic significance to southern Tunisia, where the mines are located, would serve as a base for the industrialization of the coastal areas, and would contribute towards obtaining much needed foreign exchange. The program covered modernization of mines, improvements in transportation facilities, and the processing of phosphate rock to the finished fertilizer form prior to export.

The iron ore industry was fully recovered from the effects of the disastrous floods of 1969, which completely disrupted rail transportation facilities for a long period. Both production and exports increased substantially over those in 1970.

The nonferrous and nonmetallic mineral industries continued to receive increasing attention under the auspices of the Government-owned mining company, Société Tunisienne d'Expansion Minière (SOTEMI). Particular emphasis has been placed on increasing production and exportation of lead, zinc, and fluorspar minerals.

PRODUCTION AND TRADE

Tunisia's mineral output continued to be very much export oriented. Petroleum exports amounted to 3,246,000 metric tons, or 79 percent of 1971 production. Exports of phosphate rock totaled 2,412,000 tons, which was approximately 76 percent of production. Most of the balance of the phosphate rock production was processed to the form of fertilizers, also mainly for export. Iron ore exports totaled 719,000 tons, amounting to 77 percent of total production. Exports of lead metal were 18,000 tons, or 95 percent of production, while shipments of zinc concentrates and ores amounted to 18,000 tons, or 82 percent of total production. Mercury exports of approximately 190 flasks were 56 percent of production. The exports of fluorspar in all grades totaled 29,000 tons, or 88 percent of production. Salt exports of 220,000 tons amounted to 63 percent of production. All of the barite produced was exported.

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[1] Mining engineer, Division of Nonmetallic Minerals.

[2] Where necessary, values have been converted from Tunisian dinars (TD) to U.S. dollars at the rate of TD 1=US$1.905.

Available data on mineral production and trade are presented in tables 1-3.

Table 1.—Tunisia: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971 [p]
METALS			
Iron and steel:			
Iron ore and concentrates thousand tons	945	774	936
Pig iron do	131	[e] 130	[e] 130
Steel, crude do	100	[e] 100	[e] 100
Lead:			
Mine output, metal content	[r] 22,828	22,533	20,200
Metal, primary, unalloyed plus antimonial	16,133	22,541	19,000
Mercury metal, primary 76-pound flasks	[r] 270	102	340
Silver metal, primary troy ounces	[e] 43,000	57,518	[e] 58,000
Zinc, mine output, metal content	9,356	11,948	12,043
NONMETALS			
Barite	930	1,936	1,783
Cement, hydraulic thousand tons	603	538	554
Clays, construction [e] do	250	230	240
Fertilizer materials:			
Crude, natural, phosphate rock do	2,685	3,016	3,162
Manufactured:			
Hyperphosphate do	14	28	7
Superphosphate do	33	30	422
Triple superphosphate do	333	332	
Fluorspar, all grades	12,391	30,700	32,959
Gypsum and anhydrite, crude thousand tons	10	--	--
Lime, hydraulic do	[e] 170	168	[e] 170
Salt, marine do	283	300	351
MINERAL FUELS AND RELATED MATERIALS			
Gas, natural, marketed million cubic feet	329	316	33
Petroleum:			
Crude oil thousand 42-gallon barrels	27,942	34,296	31,542
Refinery products:			
Gasoline do	1,014	747	850
Kerosine and jet fuel do	428	493	883
Distillate fuel oil do	2,276	2,242	2,274
Residual fuel oil do	2,761	2,980	2,840
Other do	1,008	1,097	1,257
Refinery fuel and losses do	1,287	1,302	1,020
Total do	8,774	8,861	9,124

[e] Estimate. [p] Preliminary. [r] Revised.

Table 2.—Tunisia: Apparent exports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Copper, metals and alloys, all forms	867	913	France 489; West Germany 219; Italy 170.
Iron and steel:			
Iron ore and concentrates	654,249	584,002	Italy 486,024; West Germany 59,289; United Kingdom 38,689.
Metal:			
Scrap	14,866	20,443	Italy 9,938; Spain 5,306; Yugoslavia 5,199.
Pig iron and ferroalloys	20,128	14,617	All to Italy.
Steel, primary forms	2,321	4,529	Do.
Semimanufactures	8,685	6,528	Norway 2,851; Italy 1,505; France 1,503; Spain 664.
Lead:			
Ore and concentrates	--	4,931	West Germany 2,650; Greece 1,311; France 970.
Metal, unwrought	10,744	14,164	Italy 8,759; France 4,400; Greece 1,005.
Mercury [2] 76-pound flasks	350	--	
Nickel, scrap	--	100	All to United Kingdom.
Silver value, thousands	$110	--	
Zinc: Ore and concentrates	15,378	17,930	Italy 13,277; Yugoslavia 4,653.

See footnotes at end of table.

Table 2.—Tunisia: Apparent exports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
NONMETALS			
Cement	89,039	22,676	All to Italy.
Fertilizer materials, phosphatic:			
Crude phosphate rock [3] thousand tons	1,852	2,109	Poland 441; France 404; Greece 178; Czechoslovakia 156.
Manufactured do	108	152	France 68; Italy 51; Sweden 30; Netherlands 3.
Fluorspar [2]	4,545	24,575	Italy 10,492; France 7,100.
Salt	265,387	199,000	NA.
MINERAL FUELS AND RELATED MATERIALS			
Petroleum: [3]			
Crude thousand 42-gallon barrels	22,082	24,442	NA.
Refinery products:			
Gasoline do	24	--	NA.
Kerosine and jet fuel do	2	--	NA.
Distillate fuel oil do	61	1,236	NA.
Residual fuel oil do	39	85	NA.
Total do	126	1,321	

NA Not available.

[1] Except where otherwise noted compiled from import data of Australia, Austria, Belgium-Luxembourg, Canada, Denmark, Finland, France, West Germany, Greece, Iceland, Ireland, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom, the United States, and Yugoslavia.

[2] Source: Bureau de Documentation Miniére (of France) Annales des Mines, September 1970, pp. 66–67.

[3] Source: U.S. Bureau of Mines. International Petroleum Annual, 1969 and 1970.

Source: Except where otherwise noted: Statistical Office of the United Nations. 1969 Supplement to the World Trade Annual. V. 3 (Africa), Walker and Company, New York, 1971, pp. 579–582; 1970 Supplement to the World Trade Annual. V. 3 (Africa), Walker and Company, New York, 1972, pp. 635–639.

Table 3.—Tunisia: Apparent imports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum, metal and alloys, all forms	478	597
Copper metal and alloys, all forms	1,492	751
Iron and steel:		
Iron ore and concentrates	NA	12,281
Metal:		
Pig iron and ferroalloys	681	831
Steel, primary forms	1,396	NA
Semimanufactures	51,464	58,056
Lead, metal and alloys, all forms	51	20
Mercury 76-pound flasks	NA	87
Tin metal and alloys, all forms long tons	35	39
Titanium oxide	100	65
Zinc:		
Oxide	187	NA
Metal and alloys, all forms	222	313
NONMETALS		
Asbestos	1,451	515
Cement, hydraulic	8,546	10,044
Clays and products:		
Crude	1,004	3,510
Products:		
Refractory	3,821	4,185
Nonrefractory	1,525	2,617
Feldspar and fluorspar	649	999
Fertilizer materials, manufactured:		
Nitrogenous	2,524	10,132
Potassic	5,757	3,499
Pyrite, gross weight	10,697	5,000
Stone, sand and gravel:		
Dimension stone:		
Crude	2,736	1,641
Worked	550	429
Other	423	1,177
Sulfur:		
Elemental	40,097	6,895
Sulfuric acid, oleum	22,255	980
Talc and related materials	NA	1,403

See footnotes at end of table.

Table 3.—Tunisia: Apparent imports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970
MINERAL FUELS AND RELATED MATERIALS		
Coal, all grades	41,345	27,810
Coke	102,491	116,597
Petroleum refinery products: [2]		
Gasoline:		
Aviation thousand 42-gallon barrels	--	3
Motor do	7	9
Kerosine and jet fuel do	r 16	175
Distillate fuel oil do	--	4
Residual fuel oil do	155	13
Lubricants do	77	92
Other do	r 107	51
Total do	362	347

r Revised. NA Not available.

[1] Except where otherwise noted, compiled from export data of Australia, Austria, Belgium-Luxembourg, Canada, Denmark, Finland, France, West Germany, Greece, Iceland, Ireland, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, U.S.S.R., the United Kingdom, the United States, and Yugoslavia.

[2] Source: U.S. Bureau of Mines. International Petroleum Annual, 1969 and 1970.

Source: For the U.S.S.R.: Official trade returns of that country; for other countries, Statistical Office of the United Nations. 1969 Supplement to the World Trade Annual. V. 3 (Africa), Walker and Company, New York, 1971, pp. 583–594; 1970 Supplement to the World Trade Annual. V. 3 (Africa), Walker and Company, New York, 1972, pp. 640–654.

COMMODITY REVIEW

METALS

Iron and Steel.—With full restoration of railroad transportation facilities, production of iron ore increased to a nearly normal rate. Production increased by 21 percent over that in 1970, and exports by 34 percent. Seventy-seven percent of the production was for export, largely to Italy. Most of the remaining production went to the El Fouladh iron and steel mill at Menzel-Bourguiba, near Bizerte. A substantial portion of the finished production from the iron and steel mill was exported, mainly to Italy.

Lead and Zinc.—Production and exportation tonnages remained relatively stable, with little change from those in 1970. All production was obtained from the operations of SOTEMI, a Government-owned company which is actively engaged in attempting to expand operations. Lead concentrates were smelted by a private foreign company, Pennaroya Tunisia, with the finished lead product being exported. Zinc concentrates were exported directly. In both cases, the products were mainly marketed in Europe.

NONMETALS

Fluorspar.—Overall production and exports increased only moderately. However, improved beneficiation resulted in a very pronounced change in the quality of the product and better profitability for the industry, with most output in the form of high-value chemical-grade fluorspar. SOTEMI was active in the further development of the industry. It doubled the crude ore capacity of its beneficiation plant at the Zariba mine, and installed a plant at the Djedida mine, both near Zaghouan in central Tunisia. SOTEMI and Reynolds Aluminum Co. concluded a joint-venture agreement for the exploration and development of additional fluorspar deposits.[3]

Phosphates.—Production of phosphate rock increased by 5 percent above that in 1970, and exports increased by 14 percent. However, production of 3.16 million metric tons in 1971 was 8 percent less than the peak output of 3.44 million tons in 1968, indicative of the problems involved in the marketing of Tunisia's low-tenor crude ores in competition with higher grade ores from other exporting countries. Approximately 25 percent of Tunisia's output was processed in Tunisia for the production of phosphatic fertilizers, primarily for export, and about 75 percent was exported in the form of phosphate rock.[4]

The Government controlled Sfax-Gafsa

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[3] U.S. Embassy, Tunis, Tunisia. State Department Airgram A-87, Apr. 25, 1972, p. 4.

[4] Page 2 of work cited in footnote 3.

Co. (Compagnie des Phosphates et du Chemin de Fer de Gafsa), which owns and operates all of Tunisia's phosphate mines, was actively engaged in the modernization of mining systems and the opening of new mines. The newly mechanized M'dilla mine operated throughout the year, with the claim being made that mechanization significantly improved profitability.[5] The new Djebel Sehib mine, which began experimental production in late 1970, is due to be in full production in 1972 at the rate of 1 million tons per year.[6] Transportation facilities were improved by the construction of a 126-kilometer railroad connecting the new petrochemical-fertilizer complex at Gabes with the mainline railroad from Gafsa to Sfax.[7]

Tunisia's two triple superphosphate producers, the Government's Société Industrielle d'Acide Phosphorique et d'Engrais (SIAPE) and, the private sector NPK Engrais, both increased their production. SIAPE had plans for the production of phosphoric acid.

The outstanding development of the year was the completion of a phosphoric acid plant at Gabes, with a rated capacity of 120,000 metric tons per year.[8] It was built for Industries Chimiques Maghrébines (ICM), a Government-owned company in which French and Italian organizations have participating interests. Firm commitments were obtained for the exportation of the entire output, principally to France. An oceangoing tanker was built and placed in service for the transportation of the phosphoric acid. Due to the high degree of success attained in marketing, a second plant was being planned together with the construction of additional tankers.

MINERAL FUELS

Natural Gas.—Production declined precipitously to only 10 percent of that in 1970, because of the near exhaustion of the reserves in the Cap Bon gasfield, the only presently available source of natural gas. A new gas pipeline was under construction from the El Borma oilfield to Gabes, with completion expected in mid-1972. This 300-kilometer pipeline, which was financed by the World Bank and the Kuwait Fund for Arab Economic Development, will have an initial capacity of 500,000 cubic meters per day. The pipeline is of significant economic importance to Tunisia, since it will supply gas to a new petrochemical-fertilizer complex at Gabes, as well as to a new powerplant that is being constructed to serve this industrial zone.[9]

Petroleum.—Crude oil production was 8 percent less than in 1970. This was because the El Borma field had reached its peak of production, while newly discovered fields had not yet been placed in operation. Exports increased by 2 percent, with a record value due to higher international prices for crude oil.[10]

The El Borma field continued to account for the major portion of Tunisia's crude oil production. Its output from 33 producing wells averaged approximately 83,000 barrels per day, or 96 percent of total Tunisian production.[11] The field straddles the Tunisia-Algeria border, with the Tunisia portion being of major importance. The Tunisian portion of the field is operated by Société Italo-Tunisienne d'Exploitation Pétrolière (SITEP) which is equally owned by the Tunisian Government and an Italian Government-owned company. Production from the field is transported through the pipeline of Compagnie des Transports par Pipeline au Sahara (TRAPSA) to the port of La Skhirra, Tunisia. This is a large pipeline, which is primarily utilized for the transportation of oil from fields in Algeria.

Two new major oilfields were discovered in 1971.[12] The onshore Sidi el Itayem field, located 30 kilometers northwest of Sfax, was being developed by the newly formed Compagnie Franco-Tunisienne des Petroles (CFTP) which is owned 50 percent each by Compagnie Française de Petroles (CFP) and the Tunisian Government. Initial testing of a well developed a flow of 2,200 barrels per day from a limestone formation at a depth of 11,484 to 13,125 feet.[13] The plan was to bring the field into production by mid-1972 at a rate of 400,000 to 450,000 metric tons per year. An 83-kilometer pipeline was being constructed to transport the oil to the TRAPSA tanker terminal at La Skhirra. The offshore Ashtart field is located 80 kilometers southeast of Sfax in the Gulf of Gabes in a water depth of 70 meters. Production was obtained from a formation 75 meters thick at a depth of 2,850 meters. It is being developed by Société Franco-Tunisienne d'Exploitation Pétrolière (SOFRATEP) in which the Tunisian Government has exercised an option for a 50-percent interest. Production was scheduled for early 1973 at the rate of about 1 million metric tons per year. Tankers will be loaded directly from floating storage reservoirs adjacent to the production platform.

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[5] Page 3 of work cited in footnote 3.
[6] Phosphorus & Potassium (London). No. 55, September–October 1971, p. 14.
[7] Phosphorus & Potassium (London). No. 56, November–December 1971, p. 21.
[8] Work cited in footnote 7.
[9] Petroleum Press Service. V. 39, No. 5, May 1972, pp. 176–177.
[10] Pages 4–5 of work cited in footnote 3.
[11] Oil and Gas Journal. V. 69, No. 52, Dec. 27, 1971, p. 104.
[12] Pages 174–175 of work cited in footnote 9.
[13] World Oil. V. 173, No. 3, Aug. 15, 1971, p. 97.

The year was marked by greatly increased competition for petroleum concessions, and saw the massive return of U.S. interests to the exploration field after a lapse of several years. The Mobil Oil Co. signed an agreement at the end of the year for a 41,000-square-kilometer onshore concession stretching across the middle of the country in the Chott el Djerid area.[14] European interests, particularly French and Italian firms with strong past connections in Tunisia, were especially active in obtaining exploration concessions, both onshore and offshore. A major reason for this intense activity was the favorable investment climate prevalent in Tunisia, including the absence of turbulent company-government confrontations which have recently harassed company operations in other countries. Generally, concession terms have allowed for government participation in the case of commercial discoveries, but with a proportionate reimbursement of past expenses and the assumption of a share of future costs.

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[14] Page 176 of work cited in footnote 9.

The Mineral Industry of Turkey

By E. Shekarchi [1]

Since the foundation of the Turkish Republic, the mineral industry has been looked upon as one of Turkey's most important resources for development. However, measures taken and laws enacted to date have not stimulated the desired level of activity. The mining sector share in the gross national product (GNP) has been as low as 1.5 percent, and cost of mine products continued to burden the national economy with a net deficit in Turkey's balance of payments.

In 1971 Turkey's GNP rose 5.5 percent, which was 2 percent short of the 5-year-plan target. Based on 1970 dollar values, per capita GNP was $273 [2] in 1971, 6.2 percent over that of 1970.

The combined efforts of the public and private sectors in mineral production generated a gross mineral value of approximately 764.3 million in 1971. The significant contributions of Turkey to the world's mineral supply were chromite, copper, magnesite, mercury, boron, and natural emery.

The protocol signed by representatives of the six members of the European Economic Community (EEC) and the Turkish Foreign Minister was ratified by the parliament in 1971. It established the scenario for Turkey to obtain full membership in the EEC over a 22-year period.

A foreign investment program, enacted by the new Government in April 1971, encourages foreign investment under the following provisions: (1) The investment technologies, that would not otherwise be available to Turkey, (2) the investment relates to a project which Turkey cannot finance from its own resources, (3) the proposed facility is export oriented and is competitive with EEC in capacity, price, and quality, and (4) the investment gives Turkish shareholders a controlling interest in the venture.

The Government accepted the principle of reorganizing mineral exploration and exploitation activities as a reform measure in compliance with the provisions of the constitution which stipulates that natural wealth and resources are under the jurisdiction and at the disposal of the State. On this basis, a Mining Reform Bill designed to introduce changes in Mining Law 6309 of March 3, 1954, was submitted to the parliament on February 2, 1971. The new bill establishes, among several important changes, the principle of exclusive State exploitation of lignite and boron deposits. This principle raised the immediate question of compensating present holders of licenses to exploit these minerals. As there was no law regulating principles of compensation, the Government prepared a second bill entitled "Withdrawal of Mining Concessions and Compensation to be paid to Concession Holders," which it presented to the parliament on March 7, 1971. By yearend, both bills had been referred to pertinent general assembly subcommittees, but no action on them was reported.

Maden Tetkik ve Arama Enstitüsü (MTA), the Mineral Research and Exploration Institute of Turkey, continued exploration work on bauxite and phosphate deposits in central and southwest Anatolia. Evaluation of copper deposits in the Murgul, Cayarli, and Horsi areas revealed new copper horizons and contributed to planning the Black Sea copper project. MTA was progressing in its studies on radioactive minerals from the Seben, Karahisar, and Bursa regions.

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[1] Physical scientist, Division of Ferrous Metals.

[2] Where necessary, values have been converted from Turkish Liras (TL) to U.S. dollars, at the rate of TL1=U.S.$0.15.

PRODUCTION

Table 1 gives the production of primary minerals and processed metals and nonmetals.

Table 1.—Turkey: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1969	1970	1971 [p]
METALS			
Aluminum, bauxite	1,500	51,067	153,253
Antimony:			
Ore and concentrate:			
Gross weight	[r] 5,286	4,616	[e] 4,500
Metal content	[e] 3,171	[e] 2,770	2,834
Regulus	35	NA	3
Chromite, salable product	453,903	[2] 477,400	[2] 633,100
Copper:			
Mine production, metal content	26,374	27,225	19,440
Metal (blister)	23,500	16,979	17,556
Iron and steel:			
Iron ore [3] thousand tons	[r] 2,510	2,949	2,079
Pig iron and ferroalloys:			
Ferrochromium	9,200	[e] 9,500	[e] 9,500
Pig iron and other ferroalloys thousand tons	[r] 948	1,034	891
Crude steel (excluding castings) do	1,170	1,312	1,118
Lead:			
Mine output:			
Gross weight of lead ore (excluding zinc-lead ore)	28,441	27,511	31,511
Metal content (including content of zinc-lead ore)	[e] 7,200	[e] 10,700	6,586
Smelter output [e]	200	200	200
Manganese ore	13,689	14,394	12,902
Mercury 76-pound flasks	6,544	8,592	10,460
Zinc ore and concentrate:			
Gross weight:			
Zinc-lead ore hand sorted	34,032	56,161	61,612
Zinc concentrate	35,882	22,204	[e] 20,000
Metal content	[r] 18,800	28,700	[e] 25,000
NONMETALS			
Abrasives, natural, emery	[r] 55,080	116,020	79,246
Asbestos	5,169	3,274	3,898
Barite	[r] 33,134	29,543	28,547
Boron minerals	324,470	388,378	571,031
Cement thousand tons	5,796	6,372	7,543
Clays, all types [e] do	15,000	15,000	15,000
Fertilizer materials:			
Crude, phosphatic, phosphate rock	1,500	--	--
Manufactured, chemical, all types	[r] 420,776	NA	NA
Fluorspar	2,094	1,665	1,100
Gypsum [e] thousand tons	[r] 300	320	340
Magnesite (crude ore)	219,033	284,807	307,814
Marble [e] [4]	100,000	95,000	115,000
Meerschaum kilograms	41,250	20,250	50,000
Quartzite	38,394	36,287	37,286
Pyrite, cupreous:			
Gross weight	129,844	91,108	58,447
Sulfur content	61,884	43,422	26,887
Salt, all types [e] thousand tons	570	610	660
Sand, glass	17,352	NA	NA
Sodium sulfate	13,785	16,616	18,467
Sulfur, refined	25,700	26,760	23,603
MINERAL FUELS AND RELATED MATERIALS			
Asphalt, natural	21,380	35,518	22,693
Coal:			
Bituminous [3] thousand tons	4,748	4,732	[2] 4,871
Lignite [3] do	5,511	5,613	[2] 6,012
Total [3] do	10,259	10,345	10,883
Coke:			
Coke oven do	1,443	1,541	1,445
Gaswork [e] do	180	180	180
Semicoke [e] do	70	70	70
Total do	1,693	1,791	1,695
Fuel briquets [e] do	50	50	50

See footnotes at end of table.

Table 1.—Turkey: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity [1]	1969	1970	1971 [p]
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum:			
Crude thousand 42-gallon barrels	25,774	24,776	24,723
Refinery products:			
Gasoline, aviation do	10	20	25
Gasoline, motor do	7,890	8,309	9,873
Jet fuel do	1,287	586	888
Kerosine do	3,277	3,383	3,744
Distillate fuel oil do	10,625	12,088	14,991
Residual fuel oil do	19,714	21,835	26,619
Other do	3,237	3,986	4,821
Refinery fuel and losses do	1,122	2,624	1,323
Total refinery products do	47,162	52,831	62,284

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, crude construction materials including a variety of industrial stone are undoubtedly produced, but information is inadequate.

[2] Estimates from reported run-of-mine production.

[3] Sales.

[4] Previously reported in cubic meters; data reported as official estimates.

TRADE

Details of foreign trade including total tonnage by commodities are given in Tables 2 and 3.

Table 2.—Turkey: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969 [1]	1970 [1]	Principal destinations, 1970
METALS			
Antimony ore and concentrates	3,542	NA	
Chromite including all grades	497,124	352,143	United States 93,444; France 79,911; Norway 49,085.
Copper metal including alloys, all forms	[r] 7,085	3,482	Spain 1,524; Japan 1,433; United Kingdom 500.
Iron and steel:			
Ore and concentrates	9,400	29,502	All to Italy.
Metal:			
Pig iron, ferroalloys, and similar materials	9,170	5,288	France 2,441; Italy 2,367; West Germany 300.
Semimanufactures	5,544	NA	
Lead ore and concentrate	17,223	5,792	West Germany 2,478; France 1,976; Belgium-Luxembourg 1,338.
Manganese ore and concentrate	4,393	1,402	All to United States.
Mercury 76-pound flasks	6,527	3,771	West Germany 1,334; United Kingdom 870; France 406; Italy 406.
Zinc ore and concentrates	25,565	26,358	Belgium-Luxembourg 13,540; West Germany 6,640; Netherlands 3,174.
Other:			
Ore and concentrate	[r] 10,826	10,092	West Germany 4,517; France 4,370; Yugoslavia 870.
Slag and other metallurgical residues	1,956	6,501	Sweden 5,787; Belgium-Luxembourg 681; West Germany 30.
NONMETALS			
Abrasives, natural	[r] 48,340	73,380	France 49,897; United Kingdom 16,834; Netherlands 6,649.
Barite	25,476	26,848	West Germany 25,378; Italy 1,470.
Boron materials:			
Crude natural borates	292,971	288,969	Italy 106,583; France 67,122; West Germany 29,710; United States 24,799.
Boric oxide and acid	6,951	5,162	West Germany 3,047; United Kingdom 580; Austria 550; Netherlands 510.
Cement	NA	97,197	Yugoslavia 71,193; Italy 26,004.
Clays and products (including all refractory bricks): Crude n.e.s	NA	3,110	All to Italy.
Fertilizer materials: Crude, phosphatic	NA	3,075	All to Denmark.

See footnotes at end of table.

Table 2.—Turkey: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969 [1]	1970 [1]	Principal destinations, 1970
NONMETALS—Continued			
Magnesite	59,895	85,307	Austria 77,243; United States 5,290; West Germany 1,772.
Pyrite (gross weight)	88,586	58,294	Italy 31,700; West Germany 26,594.
Salt and brine	33,441	NA	
Stone, sand and gravel, marble	3,391	3,408	All to Italy.
Other nonmetals n.e.s	r 2,495	NA	
MINERAL FUELS AND RELATED MATERIALS			
Coal and coke including briquets	r 141,932	280,572	Belgium-Luxembourg 81,047; Italy 62,066; Greece 43,933; Spain 41,370.
Petroleum refinery products:			
Residual fuel oil thousand 42-gallon barrels	2,006	613	United Kingdom 248; Denmark 132; Greece 129.

r Revised. NA Not available.

[1] Data for 1969 are actual recorded exports of Turkey; data for 1970 are recorded imports from Turkey by selected trading partner countries published by the Statistical Office of the United Nations in 1970 Supplement to World Trade Annual. V. 4 (Near East), Walker and Co., New York, 1972, pp. 238–245. As such, data for 1970 are incomplete and do not represent actual exports.

Table 3.—Turkey: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969 [1]	1970 [1]
METALS		
Aluminum:		
Oxide and hydroxide	236	268
Metal including alloys:		
Unwrought	13,255	12,851
Semimanufactures	6,150	3,316
Chromium, oxide and hydroxide	147	--
Copper metal including alloys, all forms	323	384
Iron and steel:		
Metals:		
Scrap	38,919	66,051
Pig iron including cast iron	--	84,473
Sponge iron, powder, and shot	274	--
Ferroalloys	13,871	6,022
Steel, primary forms	r 164,929	28,826
Semimanufactures	r 92,154	205,889
Lead metal including alloys, all forms	3,703	4,636
Manganese oxide	728	144
Nickel metal including alloys, all forms	95	98
Tin:		
Oxide long tons	16	10
Metal including alloys, all forms do	808	534
Titanium oxide	4,093	2,127
Zinc:		
Oxide	2,539	1,009
Metal including alloys, all forms	8,588	11,784
Other:		
Oxides, hydroxides, and peroxides of metals, n.e.s	121	52
Base metals including alloys, all forms	22	33
NONMETALS		
Asbestos	10,072	5,048
Barite	--	1,045
Cement	270,449	1,996
Clays and products, crude	1,626	964
Feldspar and fluorspar	2,612	1,575
Fertilizer material, crude, phosphatic	125,519	19,451
Graphite	328	341
Sulfur	14,405	--
Other nonmetals n.e.s	144	224
MINERAL FUELS AND RELATED MATERIALS		
Carbon black	10,915	9,903
Coal	--	4,146
Coke	18,914	816
Gas hydrocarbon, natural million cubic feet	NA	2,388

See footnotes at end of table.

Table 3.—Turkey: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity		1969[1]	1970[1]
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum:			
Crude	thousand 42-gallon barrels	18,318	--
Refinery products:			
Gasoline	do	347	1,156
Kerosine and white spirit	do	440	756
Distillate fuel oils	do	2,312	2,311
Residual fuel oils	do	564	36
Lubricants	do	695	102
Mineral jelly and wax	do	28	26
Total	do	4,386	4,387

r Revised. NA Not available.

[1] Data for 1969 are actual recorded imports of Turkey; data for 1970 are recorded exports to Turkey by selected trading partner countries published by the Statistical Office of the United Nations in 1970 Supplement to the World Trade Annual. V. 4 (Near East), Walker and Co., New York, 1972, pp. 246–265. As such, data for 1970 are incomplete and do not represent actual imports.

COMMODITY REVIEW

METALS

Bauxite.—The State-owned mining and financing, enterprise, Etibank, was the sole producer of bauxite in 1971. Approximately 68,000 metric tons of bauxite ore was exported, while 7,600 metric tons was consumed domestically.

Construction work on the Konya-Seydişehir aluminum plant was on schedule. It will be ready for the trial run in early 1973. The plant, when completed, will produce 200,000 metric tons of alumina, 60,000 metric tons of aluminum metal, and 22,000 metric tons of cold and hot drawn plate.

All the bauxite produced in Turkey in 1971 came from deposits near Değirmenlik, in the West Taurus mountains, where 30 million tons of high-grade ore, 50 to 60 percent Al_2O_3, has been delineated.

Chromite.—Metals and Chemical Co. of Japan contracted to import 1 million metric tons of chrome ore, mostly metallurgical grade, from Turkey on a long-term basis. The ore will be supplied over 12 years, commencing in 1972, by Etibank. The contract calls for the Japanese firm to provide expertise for erection of a ferroalloy plant (primarily ferrochrome) near Keban Dam, in southeastern Turkey.

Copper.—Production of copper decreased 29 percent, whereas blister copper output increased 4 percent in 1971 compared with the 1970 figure.

Development and construction work on the Karadeniz Bakir Işletmeleri (KBI) smelter continued during 1971. Completion is due sometime in 1972; however, there is a strong indication that even trial runs and partial production will not begin by the end of 1972, because of difficulties in obtaining machinery from abroad. When completed, the complex will produce 41,000 tons of blister copper, 365,000 tons of sulfuric acid, 6,817 kilograms of silver, and 234 kilograms of gold annually.

Iron Ore.—According to reports from the mineral officer of the Central Treaty Organization (CENTO), estimated reserves in the deposits at Divriği were 118 million metric tons of ore containing 52 to 58 percent iron; reserver at Duluco and Puriensur comprised 12 million metric tons of ore containing 55 to 65 percent iron. In Hekimhanh-Hasançelebi area, after extensive drilling by MTA, 170 million metric tons of ore containing 52 percent iron was estimated. In the Akşehir region MTA engaged in extensive mapping and prospecting during 1971, and reported probable reserves of 50 million metric tons of ore with 25 percent iron content. Discoveries of magnetite, goethite, and hematite around Kaman-Kirşehir were reported by MTA.

Iron and Steel.—Turkey has two integrated iron and steel plants. The public sector works at Karabük, approximately 110 miles north of Ankara, produces about 520,000 metric tons of rolled steel bars, rods, sections, and semis per year. The private sector flat products plant at Ereğli, built with partial financing of the U.S. Agency for International Development (AID), has a capacity of about 800,000 metric tons. In addition, several small scrap smelters with rolling mills and many small rerollers produced products for the domestic market.

Construction work on a third integrated iron and steel works at Iskenderun near the eastern Mediterranean Coast continued in 1971. Financing for this project was arranged in an agreement between Turkiye Demir ve Çelik, the Turkish State steel corporation, and Tiajpromexport of the U.S.S.R. The plant is designed to produce 1 million metric tons of steel per year in the first stage; with subsequent extension, the capacity will be increased to 2 million metric tons per year. The layout is such that it can be expanded beyond this level if required in the future.

For the first stage, the annual iron ore requirements will be about 1.7 million metric tons, of which 85 percent will be sintered.

A group of local investors, including one of the major banks in Turkey, formed a new steel company, AK Vasifli Çelik Sanayii A.S. (AK Special Steel Industry) with an initial capital of about $1 million. They were seeking a foreign firm experienced in the production of special alloy steels to provide know-how and 30-percent equity participation. Current production of special alloy steels in Turkey is approximately 70,000 tons annually. Available figures for 1969 indicate that 61,000 tons was consumed of which 10,000 tons was imported. Since the State Planning Organization (SPO) estimates special alloy steel consumption will reach 150,000 tons by 1974, the project was considered compatible with the second 5-Year Development Plan, and the new company was granted an encouragement certificate. This certificate allows custom-free importation of steel, rolling mills, and related equipment and a 30-percent investment tax credit.

Lead and Zinc.—The lead-zinc smelter for the Zemanti region remained in the planning stage during 1971. The Turkish Ministry of Power seems to have taken charge of this lead-zinc area, where SPO had proved an ore body of 3.5 million metric tons of high-grade ore. The plan includes a zinc-lead smelter with an annual capacity of 20,000 metric tons of electrolytic zinc, 10,000 metric tons of galvanized zinc, and 2,000 metric tons of refined zinc.

Provisional estimates currently put the total cost of the project at $24 million, of which $15 million will be needed to buy machinery. The Ministry of Power proposes to approach the International Finance Organization for the necessary funds.

Production of lead-zinc in 1971 was 31,511 metric tons, of which Etibank mined 12,604 metric tons, the remainder was produced by Rasih ve Ihsan and other small private firms.

Mercury.—Production of mercury reached a new high in 1971. Etibank, produced almost 48 percent of total output, and the remainder came from small private producers. Etibank's Sizma and Halikoyü retorting plants operated at 80 percent of capacity, processing mostly ore containing 0.2 to 0.3 percent mercury.

Karaburun on the Aegean seacoast is one of the oldest known mercury-producing areas in Turkey. By yearend studies conducted by Turk Civa Karaburun A.S. indicated the presence of estimated reserves of 1.5 million tons of 0.2 percent mercury. The company was seeking financial support for establishment of a 200-ton-per-day-capacity rotating furnace.

Most Turkish mercury production was earmarked for export, principally to European countries and Japan.

Uranium.—MTA has found a number of uranium occurrences in Turkey. These include Bayindir in Izmir, Lâlapaşa in Edirne, and Edremit-Kazdag in Çanakkale. During 1971, representative samples of Turkish uranium ore were sent to France for study under a bilateral agreement. As a result Bureau de Recherches Geólogiques et Minières (BRGM) conducted research on beneficiation and set up a pilot plant, which, if successful, may lead to a full production program on a joint partnership basis.

NONMETALS

Abrasives.—Production of abrasives, principally natural emery, decreased 32 percent in 1971 over that of 1970. The high quality, as well as the competitive price, of Turkish emery remained unchallenged in European markets. Most of Turkey's emery deposits are in the Milâs area of the Muğla district, which is only 13 kilometers from Güllük port on the Mediterranean Sea, where lighters of 250 tons can be loaded.

Boron.—Etibank continued to be the leading producer of boron. Etibank's production was from the Emet area, where the ore is sorted mostly by hand. Ranking second was the private producer Rasih ve Ihsan A.S., with an annual output of 25,000 tons from mines near Bigadiç in the Balikesir district. Only two foreign firms were still active in boron mining during 1971. Türk Boraks Madençilik A.S., a subsidiary of Boron Holdings Ltd., which is in turn a wholly owned subsidiary of the Rio Tinto Zinc Co., formerly worked deposits in the Balikesir district and more recently developed the Killiç deposits. Kemad S. A., controlled by Ugin-Kuhlmann and American Potash & Chemical Corp., actively mined boron minerals in the Bigadiç area.

Turkey remained the western world's second ranking supplier of boron, and has, in fact, a virtual monopoly on colemanite. Production was 47 percent higher than in 1970.

Cement.—According to United Nations data, cement production in Turkey increased 18 percent in 1971. The increase was due to expansion of existing plants as well as to opening of a new plant during the year. The new plant is at Elâziğ, Mardin Province, in southeast Turkey.

Construction of Hostas cement plant and Hostas cement product plant continued during the year. These plants are expected to be completed and go into full production in 1973.

Fertilizer Materials.—Construction of the Mersin fertilizer plant was completed during the year, and trial runs were satisfactory. This plant, owned 80 percent by Cukobirlik Co. and 20 percent by a French company, will produce 18,000 metric tons of mixed fertilizer in the initial stage and 200,000 tons after 1 year of operation.

Turkey's superphosphate plant, Azot Sanayii, at Elâziğ, eastern Turkey, went into full production of 100,000 metric tons annually in 1971 and was unable to supply about 60 percent of the domestic superphosphate requirement during the year. The remaining 40 percent was imported from western Europe and U.S.S.R.

Soda Ash.—A contract was signed by representatives of Kerbs et Cie of France, the Polish Polimex-Cekop organization, and Turkish Soda Sanayii A.S. in August 1971, calling for erection of an integrated soda plant to be built at Mersin, South Anatolia, Turkey. Construction of the plant at a cost of $16 million began in the latter part of 1971 and should be completed for a trial run in early 1974. The capacity of the plant is said to be 150,000 metric tons of soda ash and caustic soda annually.

Sulfur.—Turkey's largest mining concern, Etibank, remained its only sulfur and sulfuric acid producer in 1971. The available production data for 9 months indicated output of 19,000 tons of sulfur and 12,885 metric tons of sulfuric acid, most of which was consumed domestically.

Construction of a new sulfuric acid plant at Bandirma on the coast of the Sea of Marmara, with technical assistance from the U.S.S.R., was almost complete, and a trial run was scheduled for early 1972. This plant will have an annual capacity of 120,000 metric tons of sulfuric acid. Most of its output is slated for domestic consumption in the fertilizer and mineral processing industries.

MINERAL FUELS

Coal.—Lignite production from the Zonguldak basin was reported to be at the same rate as in 1970. However, overall coal production in 1971 increased 5 percent compared with the 1970 output.

The Elbistan lignite deposit in eastern Turkey in the Province of Maraş was opened for trial production runs. It will go into full production in 1972.

Lake Shore Mines Inc. and Nordberg Co. completed hoisting and shaft equipment installation at the new Asma coal mine in the Zonguldak basin. Full operation of the Asma mine was expected in 1972.

Natural Gas.—The natural gas pipeline from Iraq's gasfield to Turkey, which has been under discussion for the last 3 years, was put aside temporarily in 1971 because of financing difficulties. Of the two Turkiye Petrolleri Anonim Ortakligi (TPAO) natural gas findings in eastern Thrace in 1970, one tested 4 million cubic meters per day. Production from both wells was planned for early 1972, and drilling continued in the area.

Petroleum.—The State-owned TPAO put the first well of a new oilfield 5 kilometers from Adiyaman on production in 1971. Reportedly, the output was 500 barrels per day of 27° API crude. TPAO drilled five other wells in the same area during the year, but no detailed information was available.

Domestic oil production decreased 2.5 percent to just under 70,000 barrels per day, produced by Shell Oil Co., 38,798; TPAO, 19,818; Mobil-Panoil, 9,882; and the locally owned Ersan Co., 1,408 barrels.

While domestic crude oil production declined, petroleum imports increased 45 percent in 1971. Imports of Saudi Arabian crude increased by 1 million tons. Turkey purchased crude oil from the following countries for the first time: Kuwait, 507,000 tons; Egypt, 267,000 tons; Iran, 263,000 tons; and Syria, 186,000 tons.

Westates Petroleum Corp., abandoned its first offshore well in the Black Sea 32 kilometers from the coast in 260 feet of water; the drilling vessel, *Grand Isle,* was moved to a location 40 kilometers from shore in 280 feet of water along the same coast. Drilling results were not published by yearend.

Few concession changes occurred during 1971, and no new exploration licenses were granted. There were 213 valid exploration licenses covering 102,554 square kilometers as of December 31, 1971, while 16 exploration concessions were in force for a total of 911 square kilometers. In exploration activity seismic surveys decreased 60 percent, gravity work decreased 58 percent, and field geological work decreased 45 percent.

Domestic civilian consumption of petroleum products during 1970 and 1971, in metric tons, was as follows:

Product	1970	1971
Refinery fuel gas	159,903	176,465
LPG	217,696	284,324
Naphtha	121,096	131,846
Aircraft fuel	1,171	1,353
Iprojet	44,909	98,144
Gasoline, super	30,782	61,298
Gasoline, regular	903,753	890,409
Kerosine	463,245	484,982
Solvent	1,883,939	2,117,383
Fuel oil	3,210,589	4,100,008
Asphalt	199,930	183,837
Paraffin, vaseline	219	356
Mineral oils	125,680	129,697
Special preparations	4,236	7,484
Sulfur	--	744
Total	7,367,148	8,668,330

Refineries.—Construction of the Soviet designed and partially Soviet financed petroleum refinery at Aliaga, some 60 kilometers north of Izmir in southwestern Turkey, was 80 percent completed by the end of 1971. Badger Turkey Ltd., a Turkish subsidiary of British Badger, handled all construction work at the site. The plant covers 2,900 acres, with docking facilities which can accommodate two 100,000-ton tankers for crude and four smaller tankers for refined products. Reportedly the first trial of the refinery will come during the first half of 1972. When completed, the refinery will be capable of processing 70,000 barrels of crude oil per day.

The capacity of Ipras oil refinery at Izmit on the Sea of Marmara in northwestern Turkey, owned 51 percent by TPAO and 49 percent by Caltex was doubled. The refinery processed 105,000 barrels of crude oil per day, with most of the increased production earmarked for future export.

Refinery capacity of Turkey increased 15.8 percent. Reportedly, throughput was 8 to 9 million metric tons during the year. The following table shows the volume in metric tons of crude processed in 1970 and 1971 by Turkish refineries, as well as location of the plants and their sources of supply:

Refinery plant and location	1970	1971
Turkiye Petrolleri Anonim Ortakligi (TPAO): Batman:		
Domestic	799,313	825,840
Istanbul Petrol Refineresi A.S. (IPRAS): Izmit:		
Domestic	859,559	791,043
Imported	1,257,580	3,026,024
Anandolu Tasfiyehanesi A.S. (Atlas): Mersin:		
Domestic	1,795,770	1,668,859
Imported	2,507,462	2,385,958
Total	7,218,684	8,697,724

The Mineral Industry of the U.S.S.R.[1]

By V. V. Strishkov [2]

Economic growth of the U.S.S.R. is closely linked with development of its vast mineral resources. The country is a leader in the total prospected reserves of such minerals as coal, gas, petroleum, iron ore, nonferrous ores, and rare metals.

For many years Soviet industrialization was directed toward the expansion of heavy industry, which in turn necessitated growth in the production of basic mineral and metal commodities. Although successful in achieving production targets, the program did not emphasize improvements in industrial technology commensurate with that of the expanding economies in the West.

The U.S.S.R. has always had considerable difficulty in construction of mineral industry projects. Often the time required to complete projects is double that specified by the U.S.S.R. State Construction Committee. The practice of putting mines and plants into operation with many imperfections has resulted in great inefficiencies in production. Labor productivity lags far behind design indicators. Prolonged delays are necessary to achieve planned capacity. Mine renovation moves slowly. Certain republics and organizations, trying to attract large development appropriations to their area, exaggerate the value of local mineral deposits. According to Soviet reports, many projects have to be dropped after expensive reinvestigation. Vast sums of money are often spent in developing these uneconomic mines.

Despite these weaknesses, the Soviet Union has made progress in natural resource development. With complete nationalization and low-wage labor, the U.S.S.R. has maintained its position as the world's second largest producer of industrial products. It is the world's leading producer of iron, manganese, and chromium ores, pig iron, crude steel, platinum–group metals, potassium salts, and cement. It occupied second place, following the United States, in world output of aluminum, copper, lead, petroleum, natural gas, coal, and phosphate rock; it ranked after Canada in the production of zinc, nickel, and asbestos; and followed the Republic of South Africa in gold production.

Compared with 1970, 1971 saw an increase in the production of electric power by 59 million kilowatt hours, oil by 23 million tons,[3] gas by 14 billion cubic meters, coal by 17 million tons, pig iron by 3.3 million tons, steel by 4.8 million tons, finished rolled metal by 3.3 million tons, mineral fertilizers by 6 million tons, and cement by 5.1 million tons.

It was reported that production of nonferrous metals in 1971 increased as follows, in percent: aluminum, 6.3; refined copper, 7; zinc, 11.3; nickel, 8; titanium, 7; tungsten concentrate, 5; and alumina, 7. Planners have projected increased production of nonferrous metals in 1972 as follows, in percent: aluminum, 10; alumina, 12; refined copper, 5; nickel, 4; and magnesium, 5.

There were also increases in output of rare metals and oil refinery and oil chemistry products.

Expansion in the mineral industry continued to be achieved mainly through increased labor and capital rather than advancing technology. Because of shortages of mineral commodities, efforts were directed chiefly toward fulfilling quantitative goals and less attention was paid to quality. A considerable part of industrial output did not meet Soviet standards of quality. The productivity of labor and equipment continued to be below planned levels.[4] Labor turnover remained a serious problem at many mines and plants, particularly in the north and northeast. The average monthly earning of the Soviet workers and employees was 126 rubles in 1971, or 3.3 percent over that of 1970.

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[1] This publication is based entirely on a review of the sources published by the U.S.S.R.
[2] Mining engineer, Division of Fossil Fuels.
[3] All tons in this publication are metric tons.

Capital investment in the Soviet economy in 1971 rose 7 percent, down from the 9 percent increase claimed for 1970. Total investments were 87 billion rubles.[5] The commissioning of production facilities, either new, expanded, or renovated during the year were as follows, in million tons: crude iron ore, 21.0; raw coal, 17.4; pig iron, 3.4; steel, 1.9; ferrous semimanufactures, 1.9; steel pipe, 0.4; mineral fertilizers, 3.0; and cement, 2.8. New electric powerplant capacity totaled 12.3 million kilowatts. The plans for new construction, renovation, and expansion during 1971 were not all completed. Delayed start-ups of several important units were rescheduled. By January 1, 1971, planned capacity had not been reached at 38 blast furnaces, four open-hearth shops, two oxygen converter shops, and at 21 rolling mills in the Ukraine.[6] Basically, these were units where the date for reaching capacity was already past.

Although prospected reserves of mineral fuels, particularly petroleum and gas, have grown considerably, most of the reserves are located in relatively underdeveloped areas. Even though many raw materials deposits, such as manganese, chromite, diamond, asbestos, and lead, are as good as the ores mined in the rest of the world, some of the explored deposits are poor and the ore difficult to concentrate. Until very recently, most of the nickel ores mined in the U.S.S.R. were low in metal content. The situation is similar with regard to mercury and tin ores and aluminum raw materials. Approximately 20 percent of the iron ore reserves require complicated methods of concentration. Recently there has been some decline in the average content of metal in lead, zinc, copper, molybdenum, tungsten, and other ores.

The main purpose of Soviet mineral exploration in recent years has been the discovery of economic reserves that would compensate for the unbalanced or unsatisfactory distribution of the raw materials for production of major metals, all fuels, and many construction materials.

There were over 500,000 employees in the geological prospecting organizations of the U.S.S.R. in 1971, including about 120,000 graduate specialists with university and technical education. A total of 1.5 billion rubles were spent on geological exploration in 1971.

In many instances exploratory surveys and geophysical work have not substantially improved the U.S.S.R.'s mineral reserve position. This pertains particularly to nonferrous metals and rare metals and gold. Despite the extensive, specially oriented geological prospecting conducted for many years, the strains, inherent in supplying the Chimkent lead plant and the Balkhash copper smelting plant and the expanding Karaganda metallurgical plant with local raw materials, have still not been eliminated. Some operating mining enterprises, especially in the gold mining industry, are assured of explored ore reserves for only 5 to 10 years. There also are shortages of high-quality aluminum, tungsten, mercury, and partial shortages iron ore reserves.[7]

Government Policies and Programs.—The final targets of the ninth 5-year plan (1971–75) were approved by the Supreme Soviet, November 25, 1971. The main tasks of the plan are to provide a significant growth of heavy industry and steady development of the mineral industry on the basis of the greatest possible utilization of mineral resources. Significant shifts are expected in the fossil fuels and nonferrous metals industries, including rapid rates of development in the Asian part of the U.S.S.R. for aluminum, copper, nickel-cobalt-platinum, diamonds, gold, titanomagnesium, petroleum, and natural gas. It is planned to produce the following quantities of key products during 1971–75, in million metric tons, unless otherwise specified:

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[4] Pravda, Moscow, Jan. 18, 1971, p. 2.

[5] Official exchange rate is 1 ruble=US$1.215. Approximate buying power of 1 ruble relative to prices in the United States for hard goods and food ranges from about $0.20 to $0.50.

[6] Metallurgicheskaya i gornorudnaya promyshlennost' (Metallurgical and Metal Mining Industry) Dnepropetrovsk. No. 5, May 1971, p. 2.

[7] Razvedka i okhrana nedr (Exploration and Conservation of Natural Resources), Moscow. No. 3, March 1972, p. 1.

Commodity	1971	1972	1973	1974	1975
Coal	620	634	652	670	695
Steel	120	126	131	138	146
Crude oil	371	395	429	461	496
Cement	99	103.4	108.5	116.3	125
Natural gas billion cubic meters	211	229	250	280	320
Power billion kilowatt hours	790	850	913	985	1,065

Economic Integration of the COMECON countries.[8]—Since 1949 the aims of COMECON have been to increase the economic growth of member countries. Cooperation has led to the establishment of new industries, including iron and steel plants, in Poland, East Germany, Hungary, and Czechoslovakia. All COMECON requirements for crude iron and ores are being met by the U.S.S.R. The U.S.S.R. has also exported 138 million tons of petroleum and 8 billion cubic meters of gas to COMECON nations during the 1966–70 period. COMECON members have jointly constructed the crude oil "Friendship Pipeline" and the electric power grid "Mir."

In 1971, extensive efforts were made to advance socialist integration of the COMECON economy. The program was adopted by the 25th Session of COMECON, which was held in Bucharest on July 27–29 and attended by representatives of Bulgaria, Hungary, East Germany, Mongolia, Poland, Romania, the U.S.S.R., Czechoslovakia, and also by Yugoslavia.

The following are the principal goals for economic integration over the next 15 to 20 years:

The eight COMECON nations regard the coordination of the 5-year plan as one of the basic methods of planned cooperative development and as one of the main aims of forming stable reciprocally advantageous relations. They will continue to coordinate the 5-year national economic plans with the drafting of the national plan.

The COMECON countries will endeavor to streamline cooperation in mutual trade, including questions of price formation, and also develop trade with socialist nations not members of the Council and other countries. It is envisaged that they will continue concluding long-term commercial agreements based on the results achieved in the coordination of national economic plans. They also envisage deliveries that stem from agreements on the specialization and cooperation of production and other economic agreements or long-term contracts.

The program also calls for joint planning of branches of industry, specialization by each country so as to divide labor more rationally, cooperation in prospecting, joint economic forecasting, and standardization of machine systems, equipment, and instruments.

In the iron and steel industry, special attention is to be devoted to increasing the beneficiation and agglomeration capacities of mineral dressing plants in the U.S.S.R., with the objective to insure long-range supplies. The requirements of the COMECON members for metallurgical coke is to be mainly met by deliveries from Poland, the U.S.S.R., and Czechoslovakia. Under the program, proposals will be worked out in 1971–72 on joint construction in the U.S.S.R. of a big metallurgical plant by the countries concerned.

Plans call for increasing production of copper and zinc in Poland and copper and nickel in the U.S.S.R. These metals will be made available to bloc members in proportion to their capital investments in new projects in the U.S.S.R. and Poland.

Decisions of the 25th session will have important significance in the development of COMECON power and fuels industries. A forecast of the bloc countries' requirements in fuel and energy up to the end of the century is to be completed during the 1971–73 period.

By 1980, additional capacities for the production and transportation of crude oil and natural gas is to be created in the U.S.S.R. and for coal in Poland. Poland, Czechoslovakia, and the U.S.S.R. are indicated as principal producers and exporters of coal and coke, and the U.S.S.R. of crude oil and natural gas to other bloc members.

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[8] COMECON or CMEA—Council for Mutual Economic Assistance comprises the following countries: Bulgaria, Czechoslovakia, East Germany, Hungary, Mongolia, Poland, Romania, and the U.S.S.R.

The COMECON nations also agree to integrate their efforts in geological prospecting, construction of mineral projects, joint exploitation of mineral resources, and in scientific and technological research.

COMECON member-countries are placing great hopes on their international banks—the Investment Bank and the Bank of Economic Cooperation. The former will promote the development of a medium- and long-term credit system for joint enterprises connected with the expansion of economic cooperation among COMECON member-countries. The activity of the latter, concerned with short-term crediting, will be directly involved in ensuring the factual transferability of the collective currency. The introduction of free convertibility of member nation currencies, based on a convertible ruble, has already been announced.

PRODUCTION

Although the U.S.S.R. does not publish official statistics on all mineral commodities, information is available on most basic materials. These, together with published information on industrial development, provide the basis for estimating output of other commodities. Therefore, many of the figures in the production table are interpretative extrapolations from Soviet published material and represent at best an order of magnitude. Production capacity for almost all mineral commodities rose during the year.

The Asian part of the U.S.S.R. (east of the Urals) provided approximately 44 percent of the total Soviet coal output, 30 percent of the natural gas, about 20 percent of the crude oil, and over 27 percent of the electric power. The Russian Soviet Federated Socialist Republic (R.S.F.S.R.) continued to rank first among the 15 Soviet Republics in mineral production and produced over four-fifths of the gold and silver, practically 100 percent of platinum-group metals, more than 80 percent of the petroleum, over 55 percent of the coal and steel, and about two-thirds of the electric power in 1971. The Ukraine ranked first in the output of coking coal, manganese, and iron ore and second in natural gas. It provided about one-third of the total Soviet coal and natural gas production, about 57 percent of the output of iron ore, about 48 percent of pig iron production, over 40 percent of the output of steel and rolled ferrous metal products, and nearly one-half the metallurgical equipment produced in the Soviet Union.

Table 1.—U.S.S.R.: Estimated [1] production of mineral commodities

(Thousand metric tons unless otherwise specified)

Commodity	1969	1970	1971p
METALS			
Aluminum:			
Ores and concentrates:			
Bauxite, 26–52 percent alumina	r 4,200	r 4,300	4,500
Nepheline concentrate 25–30 percent alumina	r 300	r 400	500
Alunite ore, 16–18 percent alumina	r 100	r 200	300
Alumina	1,600	1,850	2,000
Metal, smelter:			
Primary	1,050	1,100	1,180
Secondary	120	120	120
Antimony, mine output, metal content metric tons	6,600	6,700	6,900
Arsenic, white (As_2O_3) do	7,100	7,150	7,150
Beryllium, beryl, cobbed, 10–12 percent BeO do	1,250	1,300	1,300
Bismuth, mine output, metal content do	50	50	55
Cadmium, smelter do	2,300	2,350	2,400
Chromium, chromite ore, 30–56 percent Cr_2O_3	1,700	1,750	1,800
Cobalt, mine output, metal content metric tons	1,500	1,550	1,600
Copper:			
Ore:			
Gross weight, 0.5–2 percent Cu	55,000	57,000	62,000
Metal content, recoverable	550	570	620
Blister:			
Primary	550	570	620
Secondary	140	140	140
Gold thousand troy ounces	6,250	6,500	6,700

See footnotes at end of table.

Table 1.—U.S.S.R.: Estimated [1] production of mineral commodities—Continued

(Thousand metric tons unless otherwise specified)

Commodity	1969	1970	1971 [p]
METALS—Continued			
Iron and steel:			
Iron ore, 55-63 percent Fe [2]	186,134	[r] 195,492	203,008
Agglomerated products:[3]			
Sinter	132,988	[r] 138,199	140,658
Pellets	9,371	10,620	13,475
Pig iron and ferroalloys:[3]			
Pig iron for steelmaking	71,521	[r] 75,649	79,044
Foundary pig iron	8,930	9,160	9,203
Spiegeleisen	86	102	124
Ferromanganese	879	968	856
Other blast furnace ferroalloys	219	[r] 54	27
Total	81,635	85,933	89,254
Steel:[3]			
Ingots	103,263	[r] 108,736	112,984
Steel for casting	7,053	[r] 7,150	7,653
Total	110,316	[r] 115,886	120,637
Semimanufactures:[3]			
Sections	30,564	[r] 31,618	32,599
Wire rod	6,868	[r] 6,950	7,350
Pipe stock	4,320	[r] 4,610	4,931
Tubes from ingots	1,441	1,497	1,577
Plates and sheets:			
Over 5 millimeters thick	9,644	[r] 10,194	11,169
Other	12,686	[r] 14,333	14,467
Total plates and sheets	22,330	[r] 24,527	25,636
Strip	7,009	[r] 7,577	8,154
Railway track material	3,528	[r] 3,573	3,683
Wheels, tires and axles	852	925	927
Unspecified shapes for sale	649	794	716
Other	81	[r] 71	81
Total semimanufactures	77,642	[r] 82,142	85,654
Selected end products:[3] [4]			
Welded pipes and tubes	6,530	[r] 7,042	7,655
Seamless pipes and tubes	5,021	[r] 5,392	5,701
Total	11,551	[r] 12,434	13,356
Cold-rolled sheet	4,533	[r] 5,178	5,458
Tinplate	505	[r] 501	515
Galvanized sheets	481	[r] 508	538
Electrical sheets	940	952	980
Cold reduced strip	718	199	223
Wire, plain	2,879	[r] 3,081	3,293
Lead:			
Mine output, recoverable metal content	440	440	450
Smelter:			
Primary	440	440	450
Secondary	90	90	90
Magnesium metal, including secondary	45	50	52
Manganese ore, gross weight[2]	6,551	6,841	7,318
Mercury metal including secondary 76-pound flasks	47,000	48,000	50,000
Molybdenum, mine output, metal content metric tons	7,500	7,700	8,000
Nickel metal, including secondary	105	110	120
Platinum, mine output, metal content thousand troy ounces	2,100	2,200	2,300
Silver metal including secondary do	37,000	38,000	39,000
Tin:			
Mine output, recoverable metal content long tons	27,000	27,000	28,000
Smelter:			
Primary do	27,000	27,000	28,000
Secondary do	10,000	10,000	10,000
Titanium metal metric tons	12,000	[r] 12,500	13,300
Tungsten concentrates, contained tungsten do	6,500	6,700	7,000
Vanadium content of exported slags do	2,768	3,064	3,175
Zinc:			
Mine output, recoverable metal content	[r] 575	[r] 575	650
Metal:			
Primary	610	610	650
Secondary	70	70	70

See footnotes at end of table.

Table 1.—U.S.S.R.: Estimated[1] production of mineral commodities—Continued

(Thousand metric tons unless otherwise specified)

Commodity	1969	1970	1971[p]
NONMETALS			
Asbestos	960	1,065	1,150
Barite	280	285	300
Boron minerals and compounds, B_2O_3 content	70	70	72
Cement, hydraulic[2]	89,800	95,200	100,300
Clay: Kaolin (including china clay)	1,800	1,800	1,900
Corundum ... metric tons	6,000	6,500	6,500
Diamond:			
Gem ... thousand carats	1,500	1,600	1,800
Industrial ... do	6,000	6,250	7,000
Total ... do	7,500	7,850	8,800
Diatomite	360	370	370
Feldspar	250	250	250
Fertilizer materials:			
Crude:			
Nitrogen compounds, N content[2]	4,509	5,423	6,055
Phosphate:			
Apatite:			
Ore 17.7 percent P_2O_5	[2] 25,500	[2] 27,200	28,000
Concentrate 39.4 percent P_2O_5	10,500	[r] [2] 11,300	11,650
Sedimentary rock:			
Ore 13 percent P_2O_5	17,500	19,000	20,000
Concentrate, 19–25 percent P_2O_5	8,750	9,500	10,000
Potassic, potash, K_2O equivalent[2]	[r] 3,183	4,087	4,807
Manufactured:			
Nitrogenous, gross weight[2]	21,979	26,442	29,530
Phosphatic, gross weight[2]	[r] 11,081	13,370	14,826
Phosphatic meal, gross weight[2]	5,076	5,709	5,420
Potassic, gross weight[2]	[r] 7,651	9,824	11,556
Other, gross weight	22	55	66
Total[2]	[r] 45,809	55,400	61,398
Fluorspar	400	410	420
Graphite	70	75	80
Gypsum	[2] 4,565	4,700	4,700
Lime, dead burned	[2] 21,341	21,500	21,500
Magnesite, crude	3,100	3,100	3,200
Mica	37	38	38
Pyrite:			
Gross weight	3,500	4,000	4,200
Sulfur content	1,850	2,100	2,200
Refractory materials:			
Shamotte[2]	[r] 6,065	6,097	6,133
Dinas (quartzite-lime)[2]	635	597	597
Magnesite and chrome magnesite[2]	1,402	1,423	1,451
Magnesite powder[2]	1,246	1,344	1,319
Total[2]	[r] 9,348	9,461	9,500
Salt, all types[2]	12,100	12,400	12,000
Sulfur, elemental (excluding sulfur content of pyrite):			
From ores	1,120	1,120	1,190
Byproduct, recovered	480	480	510
Talc	380	380	400
MINERAL FUELS AND RELATED MATERIALS			
Coal:[5]			
Anthracite[2]	[r] 76,711	75,803	75,760
Bituminous:			
Coking	[2] 161,448	400,603	411,779
Other (not specifically identified)	[r] 229,157		
Total[2]	467,316	476,406	487,539
Lignite and brown[2]	140,486	147,708	153,342
Coke, oven and beehive, including breeze and gas coke[6]	73,533	75,404	78,326
Fuel briquets:[6]			
From anthracite and bituminous coal	1,478	1,448	1,444
From brown coal	5,298	5,765	6,244
Total	6,776	7,213	7,688
Gas, natural:			
Gross production ... billion cubic feet	6,860	7,520	7,900
Marketed production[2] ... do	[r] 6,396	[r] 6,990	7,501

See footnotes at end of table.

Table 1.—U.S.S.R.: Estimated [1] production of mineral commodities—Continued

(Thousand metric tons unless otherwise specified)

Commodity	1969	1970	1971p
MINERAL FUELS AND RELATED MATERIALS—Continued			
Peat:			
Agricultural use	130,000	130,000	130,000
Fuel use	[2] 44,800	r 47,500	44,800
Petroleum:			
Oil shale[2]	23,020	24,319	26,253
Crude:			
As reported, gravimetric units[2]	r 328,373	r 353,039	377,075
Converted, volumetric units..thousand 42-gallon barrels	r 2,413,542	r 2,594,837	2,771,501

p Preliminary. r Revised.

[1] Estimates except where otherwise noted.

[2] Reported in Soviet sources.

[3] Source: United Nations Quarterly Bulletin of Steel Statistics for Europe. V. 3, No. 1, 1972, New York, 1972 p. A-22.

[4] Items reported under this heading are produced from semimanufactures listed above and possibly also from imported materials. Therefore, these data are not additive to the semimanufactures total listed.

[5] Run-of-mine coal; the average ash content of the coal shipped from the mines was 19.7 percent and the average calorific value was a little more than 5,000 kilocalories per kilogram in 1970.

[6] Source: United Nations Annual Bulletin of Coal Statistics for Europe. V. 6, 1971 New York, 1972, pp. 33, 60.

The Asian Republic of Kazakhstan, one of the most important base metal producing areas in the U.S.S.R., occupied third place in the Soviet mineral production and was the leading producer of lead, zinc, chromite, and rare metals. Metallurgical plants in the Altay region continued to suffer from inadequate feed owing to lags in mine expansion and beneficiation technology.[9]

Table 2 is derived from official statistics of the Central Statistical Administration for 1970. Official figures by Union Republic for 1971 are not available, but are expected to follow the same general pattern.

Despite expansions in the mineral industry, supply has not kept up with demand of the Soviet economy, which experienced serious shortages of minerals and metals. While the reported mineral product consumption per capita approaches that of Western Europe, there is still a significant difference in the standard of living. One reason for the apparent difference is that Soviet per capita consumption is measured in terms of minerals produced, not in terms of minerals usefully consumed. In addition, mineral product shortages often bring with them substandard products, which many times are marked as standard quality products.

Ferrous metal production volume in the

Table 2.—U.S.S.R.: Production of selected commodities, by Union Republic in 1970

(In percent)

Republic	Electric power	Crude oil	Natural gas	Pig Iron	Crude steel	Rolled steel	Iron Ore	Mineral fertilizers	Cement	Coal
Russian Soviet Federated Socialist Republic (R.S.F.S.R.)	63.5	80.6	42.3	48.8	55.1	53.50	33.1	49.2	60.6	55.2
Ukrainian S.S.R	18.6	4.0	30.5	48.2	40.2	40.50	56.9	20.8	18.1	33.2
Belorussian S.S.R	2.0	1.2	.1	--	.2	.10	--	11.1	2.0	--
Uzbek S.S.R	2.5	.5	16.1	--	.4	.40	--	7.4	3.4	.6
Kazakh S.S.R	4.7	3.7	1.0	2.1	1.9	3.02	9.3	3.5	5.9	9.9
Georgian S.S.R	1.2	--	--	.9	1.2	1.42	--	.8	1.5	.4
Azerbaydzhan S.S.R	1.6	5.7	2.8	--	.6	.73	.7	1.0	1.5	--
Lithuanian S.S.R	1.0	--	--	--	--	--	--	2.1	1.2	--
Moldavian S.S.R	1.0	--	--	--	--	--	--	--	.8	--
Latvian S.S.R	.4	--	--	--	.4	.33	--	--	.9	--
Kirghiz S.S.R	.5	.1	.2	--	--	--	--	--	1.0	.6
Tadzhik S.S.R	.4	.1	.2	--	--	--	--	.5	.9	.1
Armenian S.S.R	.8	--	--	--	--	--	--	.5	.8	--
Turkmen S.S.R	.2	4.1	6.5	--	--	--	--	.7	.4	--
Estonian S.S.R	1.6	--	.3	--	--	--	--	2.4	1.0	--
Total	100.0	100.0	100.0	100.0	100.0	100.00	100.0	100.0	100.0	100.0

Source: Narodnoye khozyaystvo S.S.R. v 1970 g (National Economy of the U.S.S.R. in 1970), Moscow, 1971, pp. 70–73.

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[9] Kazakhstanskaya pravda (Alma-Ata). May 18, 1971, p. 2; Jan. 20, 1972, p. 2.

U.S.S.R. during 1963–71 increased 1.5 times, with crude steel output reaching 121 million tons in 1971. Nonetheless, the economy continued to experience shortages of ferrous metals. Soviet published data established that millions of tons of iron and steel were not reaching end users in the form of new products because of: 1) excessively high crude metal consumption per unit of finished usable product; 2) shortages of an assortment of rolled products resulting in the consumption of heavier units; 3) heavy weight of finished usable products in comparison with analogical units for Western practice; 4) low levels of product durability requiring extensive replacement and repair; and 5) inefficient repair practices.

Approximately one-half of the profiles produced reportedly did not meet consumer specifications but nevertheless were used. Similarly, use of incorrect types and sizes of pipe in the gas and petroleum industries resulted in the use of 16 percent more metal than was necessary. According to Soviet sources, the utilization factor for metal in the metal-working and machine-building industries in 1971 was 25 percent lower than that in the United States. A study of Soviet publications showed that only about one-third of the total crude steel production is effectively used in the Soviet economy, and two-thirds is remelted or lost as a result of inefficient production and consumption of metal.

TRADE

In the Soviet Union, foreign trade is a state monopoly, administered by the Foreign Trade Ministry. Actual business is conducted through foreign trade organizations, of which there are about 40. The sale of minerals, as of other Soviet products, is carried out largely under bilateral trade agreements negotiated on a state-to-state basis.

International trade ranks high in the mineral industry's priorities. Since the value and volume of trade are directed by the Ministry of Foreign Trade, planned exports and imports reflect national goals and national priorities. There is, therefore, an implied commitment to exportation to achieve a designed trade balance. The high priorities placed upon achieving the goals may result in commodity sales at below world price levels.

In the total economy, foreign trade is relatively less important to the U.S.S.R. than it is to some other industrialized nations. However, definite political and economic objectives are sought through trade, and the Soviets intend to expand trade volume. In terms of foreign policy, dependence of some countries upon Soviet trade gives the U.S.S.R. varying degrees of economic influence abroad. Sales and purchases at appropriate places enable the Soviet Union to exert political pressure. Because the U.S.S.R. has a dominant position in the COMECON bloc, the volume of trade it affects is significantly greater than the trade value of the U.S.S.R. alone.

The value of total Soviet trade turnover (exports plus imports) expanded by 7.1 percent from 22.1 billion rubles in 1970 to 23.6 billion rubles in 1971. Exports from the U.S.S.R. were valued at 12.4 billion rubles, 7.8 percent more than that of 1970. The value of imports amounted to 11.2 billion rubles, a 6.3-percent increase over 1970.

The value of total commodity trade with various groups of countries in 1965, 1970, and 1971 follows, in billion rubles:

Group of countries	1965	1970	1971	Percent of increase 1971–65	Percent of increase 1971–70
COMECON countries	8.5	12.3	13.3	56.8	8.1
Other Communist countries	1.6	2.1	2.1	31.2	--
Total Communist countries	10.1	14.4	15.4	54.0	7.4
Developed non-Communist countries	2.8	4.7	5.1	80.6	8.3
Developing non-Communist countries	1.7	3.0	3.1	77.4	3.8
Total non-Communist countries	4.5	7.7	8.2	71.0	6.5
Total Soviet trade value	14.6	22.1	23.6	61.9	7.1

Source: Foreign Trade, Moscow. No. 5, May 1972, p. 3.

In 1971, the Soviet Union traded with 106 countries, including 85 countries with which it has trade agreements.

The volume of Soviet foreign trade with Communist countries increased from 65.2 percent of the total in 1970, to 65.4 percent in 1971. The U.S.S.R.'s major trading partners are the COMECON countries. Trade with them increased from 55.6 percent of the total in 1970 to 56.2 percent in 1971. Compared with 1970, trade with individual countries increased in 1971 as follows, in billion rubles: East Germany, from 3.3 to 3.5; Poland, from 2.4 to 2.5; Czechoslovakia, from 2.2 to 2.4; Bulgaria, from 1.8 to 2.1; Hungary, from 1.5 to 1.7; Romania, from 0.919 to 0.935; and Mongolia, from 0.231 to 0.235. The trade turnover increased with Yugoslavia from 520 million rubles in 1970 to 548 million rubles in 1971, and with People's Republic of China, from 42 million rubles to 139 million rubles. There was a reduction in trade turnover with Cuba from 1,045 million rubles in 1970 to 891 million rubles in 1971.

The Soviet Union's trade with COMECON member countries is increasing significantly. The signed commercial agreements between the U.S.S.R. and COMECON members show that total trade value during 1971–75 could be as much as 77 billion rubles, which is more than 1.5 times the total value of the previous 5-year agreements. In accordance with the agreements, Soviet trade is to increase in 1975, in comparison with 1970, 60 percent with Bulgaria, 64 percent with Hungary, 31 percent with Mongolia, 57 percent with Poland, 40 percent with Romania, 43 percent with Czechoslovakia, and 54 percent with East Germany.

The value of Soviet trade with non-Communist developed countries expanded from 4.7 billion rubles in 1970 to 5.1 billion rubles in 1971. These countries accounted for over 21 percent of the Soviet foreign trade. Compared with 1970, trade with individual countries increased in 1971 as follows, in million rubles: Japan, from 652 to 734; West Germany, from 544 to 667; Finland, from 531 to 569; Italy, from 472 to 495; France, from 413 to 576; and the United States, from 161 to 184. There was a reduction in trade turnover with the United Kingdom, from 671 million rubles in 1970 to 607 million rubles in 1971, and with Sweden, from 235 to 196 million rubles. A 33- to 35-percent increase in Soviet foreign trade with non-Communist developed countries is planned for 1971–75.

In 1971, the developing countries accounted for over 13 percent of Soviet foreign trade. Trade with these countries grew through the expansion of the economic and technical assistance that is now given to about 40 countries. Compared with 1970, Soviet trade turnover with developing non-Communist countries increased by around 100 million rubles. The largest Soviet turnover was achieved in trade with the Arab Republic of Egypt, from 606 million rubles in 1970 to 644 million rubles in 1971; followed by India, from 365 to 372 million rubles; Iran, 231 to 239; Algeria, 118 to 122; Iraq, 64 to 105; Turkey, 83 to 102; Afghanistan, 67 to 80; and Syria, 59 to 78 million rubles. In the recent period, the number of Soviet trading partners in Latin America has increased considerably.

Maritime transport plays an important role in the development of Soviet foreign trade. In 1970 it handled 121 million tons of goods moving in foreign trade, including 107 million tons destined for export.

The requirements of the U.S.S.R. for maritime transport are still far from being fully met by the domestic (flag) fleet. This is explained by the increased shipments resulting from the rapid growth in foreign trade, in part with Cuba, North Vietnam, and with the developing countries. Expansion of the Soviet ocean-going fleet has not kept up with the growth in the requirements of foreign trade. As a result, a relatively high share of maritime shipments are made in vessels of the Western fleet.

During the years 1966–70, the Soviet fleet received 340 vessels having a deadweight of more than 4.4 million tons; the carrying capacity of the fleet was increased by 43 percent. About 80 percent of the Soviet ocean-going vessels have been built during the past decade. In 1971 the Soviet ocean-going fleet was to increase the volume (tons) of goods hauled by 5 percent compared with 1970, and ton-miles sailed was to be increased by 8.2 percent.

There are plans to build a new Black Sea port by 1975. The port is to handle ships up to 170,000 tons; the water near the quays is to be over 18 meters deep. It will have facilities for handling containerized cargo and for loading and unloading coal, ore, fertilizers, and other cargo.

Qualitatively, there was no significant change in patterns of Soviet mineral trade in 1971 compared with 1970. Fuel, mineral raw materials, and metals play the largest role in Soviet exports, representing about 40 percent of total official exports during 1971. There was an increase in exports of fuel and power, from 15.6 percent of total exports in 1970 to 18 percent in 1971. Power exports in 1971 amounted to 7 billion kilowatt hours, a 31-percent increase. Crude oil exports reached nearly 75 million tons, a 12-percent increase; petroleum products sales amounted to 30 million tons; and gas exports reached about 4.6 billion cubic meters, almost a 38-percent increase compared with those of 1970.

There was a reduction in Soviet exports of ores and metals, from 19.6 percent of total exports in 1970 to 18.7 percent in 1971. However, a considerable growth was registered in nonferrous metal exports, including zinc, nearly 44 percent, and copper, 41 percent. Mineral fertilizers sales amounted to 5.4 million tons in 1971.

Over 50 percent of crude and petroleum products, about 70 percent of natural gas, 93 percent of electric power, about 90 percent of iron ore, and approximately 80 percent of aluminum were shipped to Communist countries. Soviet deliveries represented one-third of the import requirements of these countries in machinery and equipment, almost 100 percent in crude oil and pig iron, approximately 85 percent in iron ore, and about 75 percent of the mineral fertilizer demand. An even more intensive growth in the demand for oil, natural gas, pig iron, iron ore, and mineral fertilizers in the COMECON countries is expected during the 1971–80 period. As in previous years, the U.S.S.R. will ship large quantities of fuels and minerals to the COMECON countries. For example, the oil shipments are to increase to 243 million tons in the 1971–75 period, compared with 138 million tons during the previous 5 years. The U.S.S.R.'s natural gas export to COMECON members is to increase from 8 billion cubic meters in 1965–70 to 33 billion cubic meters in 1971–75; electric power supply from 14 billion kilowatt hours to 42 billion kilowatt hours; and iron ore exports (converted to metal) from 72 to 94 million tons during the same period of time. The COMECON countries are having to invest heavily in Soviet mines and plants, through the provision of machinery, equipment, pipe, and consumer goods on long-term credit to the U.S.S.R., in exchange for raw materials to be delivered in the future.

The U.S.S.R. expanded its exports of machinery and equipment to the European communist countries by 80 percent in the 1965–70 period, whereas their deliveries of machines and equipment to the U.S.S.R. increased by 37 percent. During 1971–75, less than one-half of Soviet imports from the European Communist countries (19 billion rubles out of about 40 billion) is to consist of machinery and equipment. It has been planned that Soviet exports of machinery and equipment to these countries will be worth only 11.4 billion rubles; more than one-half of these exports will go to East Germany and Bulgaria. The proportion of heavy engineering and power station equipment in Soviet machinery exports to COMECON countries is expected to rise in connection with the modernization of obsolescent COMECON steel plants and power generating facilities.

According to agreements and coordinated 5-year plans, COMECON countries are to assist in developing Soviet natural resources in return for a share of the end product, as follows: Czechoslovakia and East Germany, crude oil and natural gas; Poland and Hungary, expansion of the "Friendship" oil pipeline; Bulgaria, natural gas and metallurgical products; Romania, extraction and beneficiation of iron ore; and Hungary, asbestos, raw materials containing phosphorous, and fertilizers.[10]

Most of the U.S.S.R.'s 1971 export trade in minerals was with Europe and Japan. Mineral trade between the United States and the U.S.S.R. was insignificant. The Soviet Union is urging a formal United States-Soviet trade pact, and there are possibilities for expansion of economic cooperation. Fuels play an important role in Soviet exports and have reflected a gain in the influence of Soviet trade with the Free World. The sale of Soviet fuels abroad was concentrated in Western Europe and then extended to Japan as the demand in these energy-short areas expanded. The share of

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[10] Pravda (Moscow). Mar. 27, 1971, p. 4.

Table 3.—U.S.S.R.: Exports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum metal:			
Unwrought	320,000	368,900	East Germany 93,800; Czechoslovakia 70,600; Hungary 46,700; Poland 31,200; Japan 25,400.
Semimanufactured, rolled only	102,800	131,000	Czechoslovakia 22,300; East Germany 21,300; Bulgaria 9,174; Poland 8,096; Arab Republic of Egypt 5,253.
Antimony, unwrought	1,225	900	All to Bulgaria.
Cadmium, unwrought	743	885	Netherlands 447; East Germany 261.
Chromium, chromite ore and concentrate thousand tons	1,144	1,200	United States 410; Sweden 133; West Germany 131; Japan 124; France 114.
Copper and copper alloys:			
Unwrought:			
Unalloyed	107,400	123,100	Czechoslovakia 35,800; Netherlands 16,815; Hungary 16,600; Romania 4,095.
Alloyed	4,800	8,700	East Germany 2,051; West Germany 1,249.
Semimanufactures, rolled only:			
Unalloyed	8,200	8,400	Cuba 3,705; Bulgaria 1,841; Romania 846; Czechoslovakia 600.
Alloyed	[r] 8,500	10,300	Bulgaria 2,271; Cuba 1,238; Romania 982.
Iron and steel:			
Iron ore thousand tons	33,071	36,100	Czechoslovakia 10,820; Poland 9,894; Romania 4,245; East Germany 3,030.
Scrap do	1,325	1,400	Italy 260; Sweden 235; East Germany 220; Poland 209; Japan 161.
Pig iron do	4,692	4,800	Poland 1,484; East Germany 807; Czechoslovakia 784; Romania 499; Japan 272; Bulgaria 217; Hungary 192; Yugoslavia 104.
Ferroalloys:			
Ferrochrome	37,800	44,800	NA.
Ferromanganese	107,500	118,500	NA.
Ferrosilicon	118,400	124,900	NA.
Ferrovanadium	1,400	1,200	NA.
Silicomanganese	[r] 3,094	2,989	NA.
Other (unspecified)	[r] 24,000	33,700	NA.
Total	[r] 292,194	326,089	Czechoslovakia 103,900; Romania 77,600; Hungary 36,500; Netherlands 22,100; United Kingdom 20,600; Bulgaria 17,300; West Germany 17,100.
Ingots and other primary forms[2] thousand tons	1,125	1,214	Romania 252; East Germany 190; Hungary 182; Yugoslavia 180; Egypt 99.
Steel semimanufactures:			
Angles, shapes and sections[2] do	1,606	1,822	East Germany 433; Bulgaria 344; Poland 163; Hungary 159; Romania 112.
Wire rod[2] do	493	423	East Germany 91; Romania 88; Hungary 66; Bulgaria 61; Poland 37.
Plate[2] do	2,090	1,115	East Germany 977; Czechoslovakia 274; Poland 250; Romania 109.
Sheet:			
Tinplate[2] do	108	112	Bulgaria 50; Cuba 24; East Germany 15.
Other[2] do	740	923	East Germany 519; Poland 141; Hungary 52; Romania 21.
Strip[2] do	17	13	Yugoslavia 3; Bulgaria 3; East Germany 2.
Railway track materials[2] do	379	390	East Germany 175; Poland 90; Bulgaria 40; Romania 13.
Wheels, tires and axels[2] do	47	67	Poland 40; East Germany 22; Finland 5.
Pipes, tubes and fittings do	328	341	East Germany 181; Bulgaria 49; Cuba 37.
Wire do	72	77	Cuba 19; East Germany 17; Bulgaria 9.
Lead:			
Unwrought	97,900	92,400	East Germany 44,400; Czechoslovakia 24,900; Hungary 11,100.
Semimanufactures, rolled only[3]	45	--	
Magnesium metal, unwrought	15,000	16,800	Netherlands 5,026; West Germany 3,372; East Germany 3,202; Czechoslovakia 1,702.
Manganese:			
Ore and concentrate:			
Metallurgical grade thousand tons	1,197	1,200	Poland 365; East Germany 175; Czechoslovakia 153; France 109; Japan 96.
Battery and chemical grade do	18	16	Netherlands 6; East Germany 3; Poland 2.
Metal[3] do	[r] 248	60	All to Sweden.

See footnotes at end of table.

Table 3.—U.S.S.R.: Exports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS—Continued			
Nickel semimanufactures, rolled only[3]	170	--	
Titanium minerals, ilmenite[3]	r 4,000	6,010	All to Italy.
Vanadium slag	34,600	38,300	NA.
Zinc, unwrought	97,400	95,100	East Germany 38,200; Czechoslovakia 26,000; India 12,000.
Other nonferrous metals:			
Unwrought	40,700	39,285	NA.
Semimanufactures, rolled:			
Bimetal	1,600	2,100	Bulgaria 1,581.
Other	r 1,285	2,000	NA.
NONMETALS			
Abrasives, hard alloys	143	128	NA.
Asbestos	346,500	385,300	France 53,000; Japan 43,900; Germany 43,100; Poland 31,500; Bulgaria 21,200; Czechoslovakia 21,100; Yugoslavia 20,600; Romania 16,300.
Cement, hydraulic thousand tons	2,959	3,200	Hungary 459; Czechoslovakia 457; Libya 364; Yugoslavia 314; Poland 295.
Clays and products:			
Refractory clays and baked slate	35,300	38,300	NA.
Refractory products including magnesite products	125,200	162,000	Bulgaria 23,400; India 19,900; Romania 12,500.
Fertilizer materials:			
Crude phosphatic:			
Apatite ore thousand tons	47	49	All to East Germany.
Apatite concentrate do	5,608	5,600	East Germany 1,156; West Germany 852; Poland 658; Romania 565; Czechoslovakia 473.
Manufactured:			
Nitrogenous:			
Urea do	198	222	Sudan 102; Cuba 37; Arab Republic of Egypt 29.
Other do	958	1,049	Czechoslovakia 372; Cuba 248; Hungary 158; North Vietnam 112.
Phosphatic do	600	710	Hungary 301; Bulgaria 180; Cuba 83.
Potassic do	1,679	3,100	Poland 1,332; Hungary 365; Japan 284; Belgium 246; Yugoslavia 163; Czechoslovakia 154.
Fluorspar and cryolite (cryolite only)	5,400	5,600	Poland 1,596; Hungary 1,032; Yugoslavia 905.
Graphite	12,100	17,600	Poland 3,634; West Germany 2,622; East Germany 2,580; Hungary 1,450.
Gypsum[3]	16,100	20,100	All to Finland.
Salt	222,000	293,600	Czechoslovakia 110,100; Denmark 82,800; Hungary 61,800; Finland 36,100.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	27,800	23,200	Cuba 16,300; Arab Republic of Egypt 3,255; North Vietnam 886.
Soda ash	70,200	70,300	Turkey 22,700; Czechoslovakia 22,700; Finland 8,166; Cuba 8,019.
Sulfur and pyrites:			
Pyrite, gross weight thousand tons	1,533	1,800	Italy 585; West Germany 383; East Germany 251; Hungary 108.
Sulfur, elemental do	363	464	Czechoslovakia 185; Cuba 137; Hungary 93.
Sulfuric acid do	156	215	Czechoslovakia 77; Hungary 57; East Germany 49.
Talc[3]	8,600	13,300	All to Japan.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	39,100	45,300	East Germany 15,700; Czechoslovakia 10,827; Bulgaria 6,802; Hungary 5,373.
Coal:			
Anthracite thousand tons	4,045	4,300	France 1,385; Czechoslovakia 347; Italy 249; Belgium 221.
Bituminous do	19,194	20,000	East Germany 3,219; Japan 2,855; Czechoslovakia 2,329; Italy 1,790; Poland 1,096; Yugoslavia 998; Austria 787.
Unspecified do	60	200	NA.
Total do	23,299	24,500	
Coke do	3,996	4,100	East Germany 1,498; Romania 841; Poland 674; Finland 598.
Gas, natural million cubic feet	94,081	116,470	Czechoslovakia 47,329; Poland 35,365; Austria 33,741.

See footnotes at end of table.

Table 3.—U.S.S.R.: Exports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum:[4]			
Crude.thousand 42-gallon barrels..	469,573	490,980	Czechoslovakia 10.9 percent; Italy 10.6 percent; East Germany 9.8 percent; Poland 9.0 percent; Finland 8.1 percent; Bulgaria 7.4 percent; West Germany 6.5 percent; Cuba 6.3 percent.
Refinery products:			
Gasoline..............do....	28,257	34,000	
Kerosine..............do....	11,417	12,000	
Distillate fuel oil.......do....	74,221	85,044	
Residual fuel oil........do....	77,182	75,924	
Lubricants............do....	2,264	21,812	
Other:			
Asphalt and bitumen do....	227	220	
Paraffin.............do....	220	299	
Petroleum coke....do....	680	856	
Liquefied petroleum gas do....	370	--	
Unspecified.........do....	442	406	
Total...........do....	195,280	230,561	
Crude chemicals from coal, gas and oil distillate..........thousand tons..	398	371	East Germany 75; France 73; Italy 61.

[r] Revised. NA Not available.

[1] Except where otherwise noted, data are taken directly from official foreign trade returns of the U.S.S.R.

[2] Source: Economic Commission for Europe. Statistics of World Trade in Steel 1969 and 1970. United Nations, New York, New York, 1970 and 1971. 60 pp. and 62 pp. (Data therein reported as derived from official Soviet statistics).

[3] Data possibly incomplete; total not reported. Totals given represent sum of quantities reported under individual countries.

[4] Details on destination of crude oil and the various refinery products are not reported individually. Total exports of these commodities are reported on a tonnage basis by destination, but are not convertible to a barrel basis owing to the varying specific gravity of the different commodities that constitute the total.

Soviet oil exports in the total supply of West Europe and Japan grew only slightly from around 5.5 percent in 1960 to approximately 6.5 percent in 1971, although the energy supply in those areas skyrocketed.

The Foreign Trade Ministry's statistical reviews do not include exports of precious metals such as gold, platinum, palladium, rhodium, and others. Precious metals constitute the largest commodity group by value. The U.S.S.R. supplies 20 to 25 percent of world exports of platinum, 70 to 75 percent of palladium, and 60 to 70 percent of rhodium. Precious metals are purchased from the Soviet Union by more than 40 firms in the United Kingdom, the United States, France, West Germany, Japan, and other countries. Since 1960, when the U.S.S.R. first began to sell Soviet produced diamond, exports have assumed large proportions. There has been and will be a steady increase in the sale of cut diamond.

The U.S.S.R.'s mineral trade in recent years has been growing more rapidly than that of the rest of the world. Although most of its trade is with other Communist countries, there exists the possibility that for some mineral products, the Soviet Union could begin to assume major proportions in the world market in the near future. High on the Soviet export list to the Free World are such commodities as apatite, potash, asbestos, manganese, chromite, lead, zinc, nickel, aluminum, and precious metals.

Mineral commodity imports in 1971 included ferrous and nonferrous semimanufactures, steel pipes, bauxite and alumina, tin, tungsten concentrate, talc, and mica. Soviet purchases of machinery and equipment, including complete equipment for a chemical industry complex, accounted for more than one-half of all Soviet imports from Italy, France, West Germany, Finland, and the United Kingdom. The U.S.S.R. imported large quantities of pipes from West Germany, Italy, Japan, Sweden, and Czechoslovakia. A considerable part of the imports from developing countries were goods delivered in payment for loans from the U.S.S.R. Imports of natural gas from Iran and Afghanistan increased from

3.6 billion cubic meters in 1970 to 8.1 billion cubic meters in 1971.

Tables 3 and 4 are derived from official statistics of the Ministry of Foreign Trade for 1969 and 1970. Official detailed figures by country for 1971 are not yet available, but much the same pattern can be expected.

Table 4.—U.S.S.R.: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum:			
Bauxite[1] thousand tons	1,400	1,548	Yugoslavia 814; Greece 615; Guinea 118.
Alumina do	596	518	United States 291; Hungary 202.
Metal and alloys, semimanufactures	1,500	1,600	West Germany 528; Finland 230.
Cadmium, primary forms	217	310	Poland 216; North Korea 94.
Copper metal:			
Unwrought, unalloyed	[r] 405	1,021	NA.
Semimanufactures:			
Powder[1]	560	560	All from West Germany.
Rolled:			
Unalloyed	5,100	5,000	Yugoslavia 4,043.
Alloyed	6,000	5,000	Yugoslavia 1,586.
Iron and steel:			
Pig iron thousand tons	48	69	All from North Korea.
Ferroalloys do	7	6	Norway 4.
Semimanufactures:			
Pipe do	1,043	1,300	Romania 172; Japan 100; France 61; Poland 57.
Other, rolled only do	1,723	1,647	Poland 287; Romania 218; France 161; West Germany 156.
Lead:			
Ore[1]	52,300	50,700	All from Iran.
Metal, unwrought	24,800	38,800	Yugoslavia 15,400; United Kingdom 9,282; Bulgaria 7,006.
Mercury[1] 76-pound flasks	2,901	2,321	All from Yugoslavia.
Tin, metal, unwrought long tons	6,693	8,169	United Kingdom 4,864; Malaysia 2,581; Bolivia 297.
Zinc:			
Ore[1]	11,500	9,200	All from Iran
Concentrate[1]	7,700	17,800	All from North Korea.
Metal:			
Unwrought:			
Unalloyed	50,100	53,300	Poland 38,900; North Korea 12,200.
Alloyed	4,100	4,000	Poland 3,966.
Semimanufactures:			
Dust	1,300	1,400	Poland 1,360.
Rolled	3,800	4,200	North Korea 2,729; Poland 1,365.
Other metals, n.e.s.:			
Unwrought	[r] 1,674	313	NA.
Semimanufactures, rolled	200	500	NA.
NONMETALS			
Barite	142,700	151,700	North Korea 67,100; Romania 42,900; Bulgaria 20,200; Yugoslavia 19,300.
Cement, hydraulic thousand tons	378	481	North Korea 457.
Fertilizer materials, manufactured:			
Nitrogenous, ammonium nitrate[1]	15,400	--	
Phosphate, superphosphate[1]	115	--	
Fluorspar	134,100	144,700	Mongolia 76,600; Japan 28,700; Thailand 26,400; People's Republic of China 7,100.
Magnesite powder[1]	[r] 277,136	208,494	North Korea 207,300; France 1,194.
Mica	417	483	All from India.
Quartz crystal, optical kilograms	5,194	3,343	All from Switzerland.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	242,200	170,100	Romania 49,300; Belgium 44,900; Italy 36,000.
Soda ash	570,200	573,000	Belgium 251,700; Romania 76,000; United Kingdom 65,900; Japan 44,200.
Caustic potash	7,200	8,900	East Germany 3,067; Czechoslovakia 3,000; West Germany 2,800.
Sulfur	24,800	216,700	NA.
Talc	82,700	92,200	Bulgaria 48,700; North Korea 43,400.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	6,400	2,400	Romania 1,500; East Germany 898.
Coal, bituminous thousand tons	7,226	7,100	Poland 7,072.
Coke do	659	674	All from Poland.
Gas, natural[1] million cubic feet	71,678	91,489	All from Afghanistan.

See footnotes at end of table.

Table 4.—U.S.S.R.: Imports of mineral commodities—Continued

(Thousand metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum:			
Crude oil[1] thousand 42-gallon barrels	10,903	14,956	Arab Republic of Egypt 11,160; Algeria 3,796.
Refinery products:			
Gasoline do	5,470	5,119	Romania 50.4 percent; United States 2 percent.[2]
Kerosine do	823	621	
Distillate fuel oil do	1,306	1,332	
Residual fuel oil do	142	--	
Lubricants do	781	772	
Other:			
Asphalt and bitumen do	145	144	
Paraffin do	57	47	
Solvents do	106	152	
Unspecified do	150	200	
Total do	8,980	8,387	

r Revised. NA Not available.

[1] Data possibly incomplete; total not reported. Totals given represent sum of quantities reported under individual countries.

[2] Details on origins of various refinery products are not reported individually. Total imports of these commodities are reported on a tonnage basis by destination, but are not coverted to a barrel basis owing to the varying specific gravity of the different commodities that constitute the total.

COMMODITY REVIEW

METALS

In 1971, metal output fell short of demand. Beneficiation and metallurgical facilities continued to experience poor metal recoveries; for example, the nonferrous industry of Armenia recovered only 40 to 75 percent of the total value of components from the ore. Some 25 percent of molybdenum, 25 to 30 percent of copper, 30 to 40 percent of rhenium, and 50 to 60 percent of selenium and tellurium were lost during beneficiation processes at the Kadzharan, Kafan, and Akhtal concentrators.[11] Lead concentrates produced from mixed ores at the Lenonogorsk and Zyryanovsk complexes contained only about 60 percent of the lead present in the ore, and zinc concentrates carried only 30 to 50 percent of the zinc present in polymetallic ore.

The length of periods for the planning and construction of mines and plants was a basic shortcoming in the use of capital investments and output of metals. At the Ust'Kamenogorsk complex in Kazakhstan, for example, the mining of ores has lagged for a long time behind processing. Hence, a substantial part of the raw material requirements are brought in from other regions, despite the enormous resources of the materials in the immediate region.[12]

Serious shortcomings exist in the disproportion of officially explored and actual reserves of ores at some enterprises. For example, because of limited reserves of ores, the designed production of mines cannot be obtained at the Solnechnyy tin mining and concentration combine in the Soviet Far East, a cobalt complex in Tuva A.S.S.R., the Figadonskiy mine of the Sadonskiy lead-zinc complex in North Caucasus, and at other mines.[13]

As a result of the unsatisfactory performances at the Achinskiy, Razdanskiy, and Kirovadbadskiy alumina plants, the Krasnoyarskiy aluminum plant, Leninogorskiy and Alaverdskiy polymetallic complexes, the Lenzoloto and Baleyzoloto gold complexes, and other enterprises, the 1971 production quota for alumina, aluminum, lead, zinc, and other metals was not met.[14]

The share of the opencast method in the total volume of mining of nonferrous ores was about 70 percent, and in the ferrous industry it reached 80 percent in 1971.

Considerable effort has been put into the development and application of machinery for the mining industry. For many years, principal attention was paid to the development of machines only for basic operations, but the need for overall mechanization was evidently underestimated. The method of ore loading and conveying, which was based on the use of old or outmoded equipment, has greatly impeded an increase in labor productivity. The quality especially of drilling rigs and self-propelled equipment lagged.[15]

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[11] Promyshlennost' Armenii (Armenian Industry) Yerevan. No. 7, July 1971, p. 7.

[12] Kazakhstanskaya pravda (in Russian), Alma-Ata. May 18, 1971, p. 2; Jan. 20, 1972, p. 2.

[13] Tsvetnyye metally (Nonferrous Metals), Moscow. No. 9, September 1971, p. 4, 6; No. 1, January 1972, p. 3.

[14] Tsvetnyye metally (Nonferrous Metals), Moscow. No. 1, January 1972, p. 3.

Aluminum.—The Soviet Union, second only to the United States in aluminum production, operated 13 primary reduction plants with a total probable annual capacity as of January 1, 1972, of 1.5 million tons. Production in 1971 has been estimated at 1.18 million tons of primary aluminum, 6.3 percent above 1970. Reportedly, during the last 10 years the average increase of aluminum production was 11.3 percent per year. It is planned to increase production of metal in 1972 by 10 percent. Under the present 5-year plan, output in 1975 is scheduled to be 1.5 to 1.6 times the 1970 level.

The increase in capacity is to be provided through new potlines at the Krasnoyarsk, Irkutsk, and Bratsk plants in Eastern Siberia and the Regar plant in Tadzhikistan. Construction will be completed on the Bratsk and Krasnoyarsk aluminum plants, the first stage of the Regar aluminum plant will be put into operation, and facilities at the other aluminum plants will be enlarged during the 1971–75 period.

In order to carry out this plan, enormous resources will be required. Capital investment in the aluminum industry for the next 5 years has been set at the level of one-third of the total investment in the Soviet nonferrous industry.

The U.S.S.R. is reportedly planning to establish a vast primary aluminum plant with an annual capacity of 400,000 to 500,000 tons at Kansk in Krasnoyarsk Kray. Construction is to begin during the current 5-year period. Completion of the plant is scheduled for 1980. The Soviet Union has been negotiating with Péchiney of France on technologic and engineering expertise for the plant but has not yet awarded any contracts.

New alumina production facilities are also to go into operation at the Pavlodar aluminum plant in Kazakhstan, the Razdan chemical complex in Armenia, at the Bogoslovsk and Ural'sk aluminum plants in the Urals, and at the Kirovabad aluminum plant in Azerbaydzhan. Development of the Severoonezhskiy bauxite open pit in Archangel Oblast' is to be accelerated. An investment of 10.5 million rubles in the development of this deposit is planned for 1972.

Two potlines and the No. 2 rolling mill at the Bratsk aluminum plant, the largest in the country, and one at the Krasnoyarsk plant went into operation in 1971. Remodeling of the potlines was being carried out at the Irkutsk aluminum plant. A new potline was under construction at the Kirovabad aluminum plant. A rolling mill was under construction at the Kandalaksha aluminum plant and continuous casting was introduced. A new aluminum plant was also being built at Regar in Tadzhikistan, with a new completion date of 1974 for the first potline, and completion of the entire plant scheduled for 1977. Power will be supplied from the Nurek hydroelectric plant. Construction of this plant began in 1965, and approximately 14 million rubles were invested on construction during 1965–70. It is planned to invest an additional 138 million rubles in the 1971–75 period. About 8 million rubles were allocated in 1971.[16]

The Soviet Union signed an agreement in November 1971 to build a 100,000-ton-per-year aluminum complex at Nag Hammadi in upper Egypt near the Aswan Dam. The plant is expected to be commissioned in phases, beginning at the end of 1974. Initial plans call for three-quarters of the plant's output to be exported, presumably to the U.S.S.R.

In 1971, attention was directed toward expanding alumina capacity to meet the shortfall against aluminum electrolytic capacity. Serious deficits of alumina seem probable in the next few years. The country continues to import substantial quantities of high-grade bauxite and alumina from Hungary, Yugoslavia, Greece, Guinea, and the United States. In 1971 the Soviet Union signed long-term contracts for the supply of alumina from Japan and is anxious to negotiate long-term contracts for imports of bauxite and alumina from Australia. The Almashfyuzite alumina plant in

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[15] Narodnoye khozyaystvo Kazakhstana (National Economy of Kazakhstan), Alma-Ata. No. 3, March 1971, pp. 53–56.

[16] Sotsialisticheskaya industriya (Socialist Industry), Moscow. Nov. 2, 1971, p. 2.

Hungary which became operational late in 1971, will ship a large share of its alumina to the U.S.S.R., in accordance with Soviet-Hungarian agreements. According to Soviet Yugoslav trade agreements, the U.S.S.R. will increase imports of bauxite from Yugoslavia from 1 million tons in 1971 to 1.2 million tons in 1975. Under a protocol signed in 1971, the Soviet Union is to increase assistance to Guinea for developing bauxite deposits.

The principal reserves of presently minable bauxite are situated on the eastern slope of the Urals, in the Turgay, in Kazakhstan, and in the Tikhvin area of Leningrad Oblast'. About 75 percent of the bauxite reserves are in the Asian part of the U.S.S.R. However, reserves are insufficient, both as regards quantity and quality, to meet Soviet needs, and considerable attention has, therefore, been devoted to the development of nepheline and alunite resources. In 1971, alumina output rose by 7 percent, but the quotas were not fulfilled because of technological problems at the Pavlodar, Achinsk, Razdan, and Kirovabad alumina plants. It has been planned that 1972 alumina production will increase by 12 percent.

The last section of the Achinsk alumina-from-nepheline plant in West Siberia began operations on December 31. This plant, which took 16 years to complete, is providing alumina for the Krasnoyarsk aluminum plant. Ore for the Achinsk alumina plant comes from the Kiya-Shaltyrsk (Belogorsk) nepheline open pit on the border of Krasnoyarsk Kray and Kemerovo Oblast'. A second large alumina-from-nepheline plant is under construction at the Razdan chemical complex in Armenia. The Kirovabad alumina plant in Azerbaydzhan started producing alumina from alunite in 1965 but did not reach its planned output because of the installation of equipment that had not been fully tested. Although the first stage of the Pavlodar No. 1 alumina-from-bauxite plant in Kazakhstan was put into operation in 1964 and Nos. 2, 3, and 4 stages began operating in 1965–68, the plant has not yet attained its planned capacity.

The Northern Urals was the main bauxite and alumina producing region in 1971. Four underground bauxite mines in this region were undergoing expansion. The development of two new underground mines progressed slowly, and they were rescheduled for completion in 1972. The first stage of the Totinskiy open pit, south of the underground mines, was put into operation in November.

The second largest bauxite and alumina producing region was Kazakhstan, with the Pavlodar alumina plant No. 1 among the nation's largest in 1971. Plant No. 2 was under construction; the first section of this plant went into operation in April. The first stage of the Ayat open pit, in Kazakhstan, was commissioned in September. This is the fourth supplier for the Pavlodar alumina plant. Development of another sector of the Nizhne-Ashutskiy (Turgay) open pit mine began in October, and one additional rotary excavator was put into operation at the Severnyy open pit mine. Development of the Krasnooktyabr'skiy and Belinskiy open pits began in 1971. The capacity of open pits in this administrative district is double that of Turgay. It has been planned to invest 39 million rubles in the first stage development of an open pit mine, scheduled for the end of 1974. In 1971, the Pavlodar alumina plant did not meet its planned targets.

Special attention is being paid to the development of the Iksinskoye open pit mine near Savinsk on the banks of the Onega River in Archangel Oblast', with the first stage to be completed in 1973. It has been planned to invest 10.5 million rubles in 1972.

Antimony.—The Kadamzhay combine in Kirgizia remained the principal antimony center and its integrated facilities produced most of the country's refined product. The second stage of the electrolysis plant at this combine was completed in January.

The first section of the new antimony and mercury concentration plant at the Anzob mining and concentration combine (Dzhidzhikrut complex) was put into operation in April and the second one in December. A new plant replaced the mill constructed in the early post war years. It is planned to put new facilities into operation and to recover metallic mercury during the 1971–75 period. The rich Sarylakh antimony-gold deposit in Yakutia, which is located near the Polar Circle, was under development in 1971. It is planned to begin development of the Udereysk deposit in Eastern Siberia during the 1971–75 period.

Chromium.—With an estimated output of 1.8 million tons, the U.S.S.R. was the leading chrome producer and exporter in 1971. Chrome ore output by 1975 is expected to be about 18 percent higher than that of 1970, rising to 2.25 million tons in 1980. Estimated exports totaled some 1.1 million tons in 1971, with about 90 percent going to non-Communist countries. Approximately one-third of the output was consumed or stockpiled in the U.S.S.R.

The Donskoye mining administration at Khrom-Tau in Aktyubinsk Oblast' is the only supplier of high-quality ore. The grade of most ores is high enough to be shipped without beneficiation other than hand picking.

Two new small pits and the first Soviet chromite concentration mill, with an annual capacity of 1 million tons of crude ore (300,000 tons of concentrate), were under construction at Donskoye in 1971. Completion of the mill was planned for 1970 but was rescheduled for 1975. Plans also call for the development of the first underground mine at Khrom-Tau which was to begin in 1972 and the start of development of the "40 Let Kazakh S.S.R." mine. Expenditures of 130 million rubles are projected for 1974. The Soviet chromium industry continued to experience considerably difficulty in completing projects on schedule.

Cobalt.—Production continues to be concentrated at the Norilsk complex (West Siberia), Severonikel' and Pechenganikel' combines (Kola Peninsula), and Yuzharalnikel' combine (Urals); at the Ufaley and Rezhsk nickel plants in the Urals, and also at some copper plants. The estimated rise in output of metal in 1971 was mainly due to initial production of concentrate at Khovu-Aksinsk' combine and nearly doubling the output of cobalt by Yuzharalnikel' combine in Orsk. Cobalt production did not reach 1971 planned quotas primarily due to design defects at the Khovu-Aksinsk complex.[17]

Copper.—Production of blister copper in 1971 is estimated at 760,000 tons, including 140,000 tons of secondary copper. The estimated 7 percent increase in metal output was due mainly to new production from the first stage at the Dzhezkazgan smelting and refining complex in Kazakhstan. Under the new 5-year plan, output in 1975 is scheduled to be 35 to 40 percent over the 1970 level. The plan provides for a 30-percent increase in copper production in Armenia and a 70-percent increase in Kazakhstan. If the 35-percent growth in copper output is achieved, the U.S.S.R. will produce close to 1 million tons of primary and secondary copper by 1975. This might allow some surplus for export outside the Soviet bloc. It has been planned that blister copper production will increase in 1972 by 7 percent over 1971.

During the 1971–75 5-year plan, the Dzhezkazgan and Almalyk complexes are to be expanded. The Norilsk complex is also to be expanded by working the rich Oktyabr'skiy copper-nickel deposit. New facilities are to be added at several other copper plants. The construction of the Madneul'skiy mining and concentrating combine in Georgia is to be completed.

Gross reserves in 1971 were estimated at 40 million tons of contained metal, chiefly in low-grade sandstone and porphyry deposits suitable for open pit mining. The reserves include several million tons of copper in high-grade pyritic ores containing other metals, and a small quantity in ores of molybdenum, titanium, and other metals. Over half the reserves are situated in Kazakhstan. The cutoff grade ranged from 0.4 percent copper at the Kounrad open pit mine in Kazakhstan to 1 percent at the underground mines in the Urals. Approximately 80 percent of all copper was mined by open pit methods in 1971.

The Soviet Union was negotiating with Japanese, French, and British companies to develop the Udokan copper deposit in East Siberia, northeast of Lake Baykal. At the same time, the U.S.S.R. has offered assistance to the nationalized Chilean copper mines.

The Urals continued to be the main center of copper production. Output of blister copper at the Mednogorsk copper and sulfur combine increased by several percent. During the current 5-year plan period, the Gay mining and concentrating combine in Orenburg Oblast' is to increase its output of copper concentrate by 52 percent. Reportedly, output of ore at this combine in 1971 was increased by 18 percent, compared with the 1970 level. It is planned to begin development of the Molodezhnoye, Ozernoye, and Uzel'ginskoye deposits in the Urals during the 1971–75 period. The Zimneye copper deposit was discovered in the eastern part of Orenburg Oblast' in 1971. It is the fourth deposit found in the Urals in the past 3 years. The Uzel'ginskoye copper deposit was under exploration.

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[17] Tsvetnyye metally (Nonferrous Metals), Moscow No. 9, September 1971, p. 4; No. 1, January 1972, p. 4.

In Kazakhstan, the second largest copper-producing region, the first stage of the Dzhezkazgan metallurgical complex was completed in March. By 1975, production of blister in Kazakhstan is to be increased by 58 percent, and production of refined copper is to be increased by 77 percent over the 1970 level. A large part of this increase will come from the completion of the second stage of the Dzhezkazgan complex, development of the first stage of mine No. 65, construction of concentration plant No. 2, and completion of the first stage of concentration plant No. 3. Approximately 1,400 million rubles, 37 percent more than that of the 1966–70 period, is to be invested in nonferrous metallurgy in Kazakhstan during the 1971–75 period. Production of refined copper at the Dzhezkazgan plant is slated to be raised by 16 percent in 1972. The exploration of the "50 Let Oktybrya" copper deposit in West Kazakhstan was completed in 1971.

The first section of the Sayakskiy open pit mine was put into operation at the end of 1971. This is a second (after the Kounrad) open pit mine of the Balkhash complex in Kazakhstan. It has been planned that the second section of this open pit mine will be commissioned in 1973 and the final section in 1974. In the future, the Kounrad open pit mine is to be enlarged. The Orlovsk mine and concentrator, which also will supply the Balkhash complex, were under construction in 1971. Additional concentrating facilities for the processing of ore from the Sayakskiy open pit mine were under construction at the Balkhash mill. A rolling mill (produced in Czechoslovakia) was being installed at the Balkhash complex.

The development of the Skipovaya shaft at the Irtysh mine and the renovation of the Belousovskaya concentrator, at the Irtysh polymetallic complex in Kazakhstan, were completed in December. A new copper smelting plant is to be put into operation at this complex during the 1971–75 period. It has been planned that copper output at the Irtysh complex will increase 50 percent during the 1971–75 period. The Irtysh mine, which took 13 years to complete and which has been in operation for 7 years, has not yet attained its designed capacity. The production cost of the ore mined is double that which was planned.[18] The development of the second stage of the Tishinskaya underground mine at the Irtysh complex is to be completed by 1975. The Nikolayevskiy mining and beneficiation combine of the east Kazakhstan copper and chemical complex was under construction in 1971. The first stage of the open pit mine was put onstream in January. The second stage is to be completed by 1975. Production of blister copper is to be increased by 23 percent during the 1971–75 period. It is planned to invest 44 million rubles for development of the Nikolayevskiy combine in the 1971–75 period. Approximately 7 million rubles were invested in 1971 and up to 10 million rubles is to be allocated in 1972.

At the Alaverdy complex in Armenia refined copper production is to be increased by 31 percent during 1971–75. Output at the Kadzharan copper-molybdenum mining and concentrating combine is to be increased by 35 to 40 percent. About 320 million rubles have been allocated for the development of nonferrous industry (copper, molybdenum, aluminum, and gold) in Armenia during 1971–75. The obsolescent reverberatory furnace at the Alaverdy complex was replaced by a new one. The capacity of the new furnace is 1.5 times more than the previous one. The recovery of copper in copper concentrate at the Kadzharan mill was not more than 72 percent in 1971.[19]

The largest Soviet copper-nickel mine, the Oktyabr'skiy mine, at the Norilsk metallurgical complex, was under development; completion of the first stage is scheduled for 1975. Norilsk output is planned to increase by 60 percent in the 1971–75 period, including 20 percent as the result of completion of an oxygen plant. It is planned to complete the second stage of the Komsomol'skiy mine at this complex by 1972. Development of the "Vostok" mine of the Pechenganikel complex at Kola Peninsula was close to completion in 1971. A deep water section is to be built at the port of Murmansk, mainly to handle ore from Norilsk. The plan calls for large quantities of Norilsk ore to be shipped to the Pechenganikel and Severonikel complexes at Kola Peninsula.

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[18] Kazakhstanskaya pravda (Alma-Ata). Mar. 23, 1972, p. 2.

[19] Promyshlennost' Armenii (Armenian Industry), Yerevan. No. 11, November 1971, p. 58.

Copper production at the Almalyk complex in Uzbekistan is to be increased by the development of the new open pit mine; completion of the first stage is scheduled by 1975. It is also planned to complete the first stage of the Madneuli mining and concentrating combine in Georgia by 1973 and the second (final) stage by 1975. The first stage of a copper mine is to be developed in Azerbaydzhan in the 1972–75 period. Output of copper concentrate is to be increased at Urup combine by 1975.

Despite the upswing achieved in recent years in the Soviet copper industry the solution to the problem of complete utilization of raw materials remained unsatisfactory. Considerable amounts of metals were lost at the concentrating plants. At some copper smelters dust-washing operations were done poorly. Capacity of shops for processing dust was inadequate. In the copper industry, practically no facilities existed for reprocessing dumped slags.

Gold.—In 1971, the U.S.S.R. produced an estimated 6.7 million troy ounces of gold and was the world's second largest producer. Over three-quarters of the total output came from the Soviet Far East and East Siberia; most of the rest came from gold and polymetallic ores in Kazakhstan, the Urals, Siberia, Armenia, and Uzbekistan. Nearly all of the Soviet placer production came from Kolyma, Aldan, Dzhugdzhur, Indigarka, Yana, Chukotka, and the Urals. Alluvial deposits contributed about two-thirds of the output.

Extensive prospecting for gold continued in the Asian sector of the country. The discovery of several vein deposits was reported in 1971 in Kazakhstan, Central Asia, and the Transcaucasus. Six new placer deposits reportedly were found at Chukotka and other regions of the Soviet Far East and Yakutia. Prospecting teams did not have a sufficient quantity of modern geological prospecting and power equipment and means of transportation.

During the current 5-year plan, production of gold is to be increased in the Kolyma and Lena areas, Kazakhstan, the Urals, Armenia, Uzbekistan, and other regions. It is planned to renovate the Nizhne-Kuranakskaya, Sovetskaya, Darasunskaya, Taseyevskaya, Lebedinskaya, and Matrosov gold plants in Siberia and the Soviet Far East and to construct gold plants at Ararat in Armenia and Angren and Zarafshan (second stage) in Uzbekistan. Estimated production is to reach 7.7 million troy ounces in 1975 and 8.9 million ounces in 1980.

Magadan Oblast' was the main center of gold production, where 32 placer mines, 18 dredges, and over 500 sand-washing rigs were in operation in 1971. Roughly one-third of the gold came from mines developed in the 1966–70 period. Although Magadan Oblast' met its annual planned quotas in 1971, only the Mandrikova placer mine had in operation the planned quantity of washing rigs. The Bilibinskiy mining and concentrating combine, for example, put into operation only 68 rigs instead of the planned 85. As the gold content of the placer deposits is steadily declining, increased volumes of sand must be processed to keep gold output at present levels. At many mines the recovery of gold in washing was only 50 percent of the total in the sand.[20] As a result of this poor recovery and poor development of mines, production costs of metal have increased.[21]

The first winter, sand-washing rigs in Magadan Oblast', with daily design capacity of 500 cubic meters of sand each, were put into operation at the Burkanda, Dvadzat'vtorogo Syezda, and Sorok Let Oktyabrya placer mines in October. Sand from five underground mines was being hauled by dump trucks to these rigs. The first of several 2.5-cubic-meter shovels and large tractor-scrapes, equipped for operation under the most severe weather, were delivered to gold placer mines of Magadan Oblast' in April. Gold extraction began at the new Omchug placer mine in September. The Dukar deposit in Omsukchanskiy county and the Detrinskiy deposit in Tenkinskiy county were under development. Gold output in Magadan Oblast' by 1975 is planned to be 18.9 percent higher than in 1970.

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[20] Sotsialisticheskaya industriya (Socialist Industry), Moscow. Apr. 8, 1972, p. 2.

[21] Tsvetnyye metally (Nonferrous Metals), Moscow. No. 1, January 1972, p. 4.

Gold output in Yakut A.S.S.R., the second largest gold-producing region, increased by about 7 percent compared with 1970. All four combines in this region, Yakut, Dzhugdzhur, Indigarka, and Aldan, reached planned targets; at Aldan, the Kuranakhskaya gold extracting plant was being renovated and enlarged. Additional capacity at this plant is to be commissioned in 1972, and planned capacity is to be doubled by 1975. Within Yakut A.S.S.R. and Irkutsk Oblast', the Lenzoloto Trust was a leading gold-dredging enterprise. Reportedly, this Trust operates the world's largest electric dredge. Although the Yakut Territorial Geological Administration fulfilled its 1971 plan for expanding reserves of all mineral commodities, it achieved somewhat poor results in expanding gold reserves. Two electric dredges were reported to have been commissioned in Khabarovsk Kray in 1971; one at Kherpuchinskiy and another at the Kaygachan placer deposits. Two new placers were under development. The Mnogovershinnaya (Gopka Zolotaya) deposit in this region was being explored.

Two 250-liter electric dredges were commissioned in Amurskaya Oblast'; one at the Selemdzhinskiy and another at the Dambuki placer mines. It is planned to put into operation in this oblast' three more electric dredges, including one at the Soloveyskiy placer mine, during the 1972–75 period. Because of a lag in development at the Taseyevo mine, the Baleyzoloto combine in Chita Oblast' did not meet 1971 gold production targets. A large placer gold deposit in the Aliya valley of this oblast' was under development. Reportedly, the water-jet method of mining was introduced at the Miass, Polyakovskiy, and Leninsk placer mines in the Urals.

Sinking of the Novaya 890-meter shaft at the Bestube deposit in Kazakhstan, the deepest in the Soviet gold mining industry, was completed. It has been planned that construction of the Zodskiy gold-ore combine and the Ararat gold-extracting plant in Armenia will be completed by 1975; construction of this combine began in 1964. An experimental concentration plant at Zodskiy combine was put into operation in 1971.

The Muruntau deposit in the Kyzyl-Kum desert, the Charmitanskoye and Kokpatasskoye deposits in Western Uzbekistan, and the Kochbulak deposit in the Tashkent area of Uzbekistan were under detailed exploration in 1971.[22] It is planned to complete exploration of these deposits, which started in 1963, by 1975. The first stages of the Kochbulak mine and the Zarafshan (Muruntau) gold-extracting plant were put into operation in 1969. The future development of gold mining in Uzbekistan will be based on the deposits at Muruntau, Kochbulak, and Kauldy. During the current 5-year plan period it is planned to start construction on the second stages of the Zarafshan mill and Kochbulak mine. It is also planned that construction of a gold-extracting plant at Angren be completed by 1975, to process ore mined at the Kochbulak and Kauldy deposits. Output of gold in this republic is to be trebled compared with the preceding 5-year period. In 1972, a shop for processing gold and silver slurry is to be put into operation at the Almalyk complex in Uzbekistan.

Iron Ore.—In 1971, 71 underground mines and 62 open pit mines, with a total capacity of about 260 million tons per year, produced 203 million tons of usable ore (direct smelting ore plus concentrates), or 373 million tons of crude ore; about 79 percent came from open pit mines. In spite of this, the 1971 production quota for iron ore was not fulfilled. About 52 percent of both open pit and underground mines had a rated capacity of less than 1 million tons of crude ore per year. About 20 percent of the open pit mines exceeded 5 million tons per year, and only 4 percent of the underground mines were over 4 million tons of crude ore per year.

Capacity was increased by 21 million tons in 1971 compared with a planned increase of 38.2 million tons of crude ore. Production of usable ore is scheduled to reach 254 million tons (478 million tons of crude ore) in 1975. To achieve the planned goals, capacity for crude iron ore is to be increased by 192.5 million tons. It is planned to increase concentrate production from 39.9 million tons in 1970 to 99 million tons by 1975 and pellet output from 10.6 to 38.3 million tons. The average iron content of usable ore is to rise from 58.8 percent in 1970 to 59.8 percent in 1975. Soviet production of usable iron ore may reach 280 million tons by 1980. The U.S.S.R., the world's largest producer of iron ore, is reported to have plans for extending its exports outside the Soviet bloc.

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[22] Ekonomika i zhizn' (Economy and Life), Tashkent, in Russian. No. 11, November 1971, p. 46.

A delay in developing additional mining and concentrating capacities with respect to the goal of 192.5 million tons set under the 5-year plan resulted in difficulties in obtaining needed raw material at metallurgical operations.

Many projects were commissioned in spite of numerous imperfections. As a result, labor productivity was below planned levels, much of the personnel was occupied in repair and auxiliary operations.[23]

Agglomerate output reached over 140 million tons in 1971; and pellets, 13.5 million tons. Concentrate came from 99 plants, of which 29 had sintering facilities and three had pelletizing facilities; more than 79 percent of all ore was beneficiated, and over 62 percent of the usable ore was in concentrates.

A program adopted by COMECON in 1971 provides for increased cooperation among member-countries in the development of mining and beneficiation of iron ore in the U.S.S.R. as a supply source for COMECON countries. The U.S.S.R. was negotiating with Finnish companies to develop the Kostamus iron ore deposit in Karelia.

The Ukraine produced 57 percent of iron ore in 1971, 95 percent from the Krivoy Rog Basin, and the 5-year plan provides for increased output of 14 percent during 1971–75. The Urals was the second largest producer, followed by Kazakhstan, West Siberia, the Kursk region, and the Kola Peninsula. The last concentration section, No. 8, of the Dneprovskiy mining and beneficiation combine, with a total annual capacity of 7.35 million tons of crude ore, was completed in January, and the third and final stage of the Zaporozhskiy (Ukraine) combine was under construction in 1971. The second stage of the Artem No. 2 underground, with an annual capacity of 4.5 million tons of crude ore, and the Rodina mine, with a capacity of 2.7 million tons, were put into operation in Krivoy Rog in 1971. Commissioning of concentrating section No. 28 at the Ingulets combine in Krivoy Rog in January, with an annual capacity of 0.5 million tons of concentrate, brought its total annual capacity to 12.5 million tons of concentrate. The first stage of the pellet plant at the Northern combine in Krivoy Rog was about to be commissioned, and construction of the second stage of the Novokrivorozhskiy combine began in 1971.

In the Urals, the second stage of the Kachkanar pelletizing plant, with an annual capacity of 1.4 million tons, started up in March. The "Yuzhnaya-2" underground mine of the Goroblagodatskiy mining administration, with an annual capacity of 0.8 million tons, was completed on December 31.

Production of usable ore in Kazakhstan reached 18.8 million tons in 1971. The Sokolovsko-Sarbayskiy mining and concentration combine had an annual throughput of 26.3 million tons of crude ore. The third stage (4 sections) of the pelletizing plant at this combine, with an annual capacity of 2.8 million tons of pellets, was completed in 1971. The plant reached its designed annual output of 8.4 million tons of pellets and produced 6.5 million tons in 1971. Development of two underground mines, Yuzhno-Sarbayskaya, with an annual capacity of 4 million tons of crude ore, and Sokolovskaya, with a capacity of 2 million tons, began at this combine in 1971. Completion is scheduled by 1975.

At the Lisakovskiy mining and concentrating combine, with a designed capacity of 36 million tons of crude ore (4 percent Fe) per year, construction of which began in 1960, the No. 1 open pit mine, with a capacity of 4.5 million tons of crude ore was commissioned in December. It has been planned that production of crude iron ore in Kazakhstan will be increased from 29.2 million tons in 1970 to 48.6 million tons by 1975.

The principal ore deposits of the Kursk Magnetic Anomaly (KMA) are located in the Belgorod, Kursk-Orel, Staryy Oskol, and Novyy Oskol areas. The largest deposits are the Yakovlevo, Gostishchevo, Lebedinsk, Yuzhno-Lebedinsk, Stoylensk, Mikhaylov, Kurbakin, Pogremets, and Chernyanka. Five enterprises of the KMA, the Legedinck, Yuzhno-Lebedinsk, Mikhaylovskoye, Korobkovskoye, and Stoylenskoye, produced over 18 million tons of crude ore in 1971. It is planned to increase annual production at KMA up to 40 million tons by 1975. The first stage of the Lebedinck mining and concentrating combine in Belgorodsk Oblast', with a capacity of 7.5 million tons of crude ore per year (3.4 million tons of concentrate) was not completed as planned. Construction started in 1967 and completion has been rescheduled for 1972. The exploitation of the new Zapadnyy open pit mine, with an annual capacity of 1 million tons of crude ore, began at the Kamysh-Burunskiy iron ore combine in the Crimea in October.

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[23] Gornyy zhurnal (Mining Journal), Moscow No. 8, August 1971, p. 49: Stroitel'naya gazeta (Construction Gazette), Moscow, Nov. 24, 1971, p. 2.

Discovery of the following iron ore deposits was reported in 1971: in the Kovdor area of Murmansk Oblast', the Mariupol' near Zhdanov in the Ukraine; and in the Soviet Far East, between the Ida and Seledzha Rivers.

Iron and Steel.—In 1971, the U.S.S.R. produced 3.3 million tons more pig iron, 4.8 million tons more steel, and 3.3 million tons more rolled ferrous metals than during 1970. Although production increased, a large quantity of steel products was imported from Japan and Western countries. The quality of goods produced was low, especially electric steel.[24] The steel industry suffers from technological difficulties and low productivity.[25] According to Pravda,[26] at 17 blast furnaces, 23 open hearths, 7 oxygen converters, and 43 different mills, which were put into operation after 1960, over 18,000 workers were employed above the number envisaged in the plan. The shortage of many steel products in the U.S.S.R. is creating a major problem in the Soviet economy.[27]

Additional capacity for pig iron was 3.4 million tons (planned quota, 3.05 million tons); for steel, 1.9 million tons (3.82); and for finished rolled products, 1.9 million tons (2.65). About 2,700 million rubles were invested for new iron and steel enterprises in 1971, about 18 percent more than that of 1970.

It has been planned that six new blast furnaces, 12 oxygen converters, 15 electric furnaces, and over 35 rolling mills will begin operations during the 1971–75 5-year plan. One of the main aims of the plan is to improve the quality and to increase the range of rolled products. This is to contribute to cutting down metal waste by 18 to 20 percent,[28] improving metal consumption, and to increasing the life and reliability of machinery. It has been planned that construction of the ferrous metallurgy complex in the Kursk region will begin and construction of the Karaganda metallurgical works will be completed during the 1971–75 period. Investment in the iron and steel industry is to grow almost twice as fast as overall investment in the Soviet economy in 1971–75, but the iron and steel industry has not realized all the investment allocated for it in 1966–70. It has been decided to invest 17,000 million rubles in the iron ore and steel industry in the new 5-year plan, or about 70 percent more than was realized in the last 1966–70 5-year plan.

It is planned to build a joint large COMECON steelworks in the U.S.S.R., presumably in the Kursk region. The Zenica iron and steel plant in Yugoslavia was under construction with Soviet economic and technical aid, and a Soviet-built 2-million-ton-per-year, wide hot-strip mill at Galati steelworks, Romania, was started in 1971.

According to a Soviet-Egyptian agreement signed in August, the U.S.S.R. will construct the first stage of the Egyptian iron and steel complex at Helwan in mid-1973 and the second and final stage in mid-1975. Production in the latter stage is to reach about 1.5 million tons per year. The Indonesian Government signed a survey contract with the U.S.S.R. to investigate the feasibility of resuming construction of the abandoned Tiilegon steel project. The first stage of the Iran's Isfahan steelworks, which is being built by the U.S.S.R., will have a capacity of 600,000 tons per year; it was planned to raise the capacity of this works to 4 million tons per year in the future. Under an agreement, the U.S.S.R. is to help Algeria increase its iron and steel annual production capacity from 0.45 to 1.8 million tons. The Soviet technical mission is studying the possibility of establishing a steel industry in Nigeria. Japan and the Soviet Union have agreed to establish an exchange of iron and steel production techniques.

Pig Iron.—In 1971, 36 enterprises, operating 135 blast furnaces, produced 89.3 million tons of pig iron, a 4-percent increase from that of 1970. Estimated output for 1975 and 1980 is 104 million tons and 125 million tons, respectively. In 1971 blast furnaces with volumes of over 1,000 cubic meters accounted for nearly 90 percent of the U.S.S.R.'s total pig iron production. Of the operating blast furnaces, 17 had volumes of 2,000 or more cubic meters. Average blast furnace capacity is reported at 1,135 cubic meters. About one-half of all blast furnaces used oxygen for enrichment; at some plants, up to 30 percent oxygen was used in combination with natural gas. Approximately 85 percent of the pig iron was being produced by partial use of natural gas at 104 blast furnaces.

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[24] Sotsialisticheskaya industriya (Socialist Industry), Moscow. Sept. 22, 1971, p. 2.

[25] Pravda (Moscow). Oct. 19, 1971, p. 2.

[26] Pravda (Moscow). Jan. 18, 1971, p. 2.

[27] Rabochaya gazeta (Workers' Gazette), Kiev, in Russian. Dec. 22, 1971, p. 3.

[28] Voprosy ekonomiki (Problems of Economics), Moscow. No. 9, September 1971, p. 123.

At the beginning of 1971, blast furnace No. 3, the Soviet's largest with a volume of 3,000 cubic meters and an annual capacity of 1.7 million tons of pig iron, was put into operation at the West Siberian plant. The 2,700-cubic-meter No. 3 furnace at the Karaganda plant in Kazakhstan was completed in December. Enlargement of the No. 3 blast furnace at the Zaporozhye steel plant in the Ukraine was completed in November, and its volume increased from 1,300 to 2,500 cubic meters. The 3,200-cubic-meter No. 5 blast furnace, with an annual capacity of 2.34 million tons of pig iron, which was under construction at the Novolipetsk works, was scheduled for completion in December 1972. Construction of the 2,000-cubic-meter No. 4 blast furnace at the Orsk-Khalilovo complex and No. 9 (3,000 cubic meters) at the Krivorozhstal' plant began in 1971. Output of blast furnaces Nos. 1, 2, and 3 at the Orsk-Khalilovo complex is to be increased during the present 5-year period, and No. 4 furnace is to be completed in 1974. Output of this complex is to be increased by 1.59 million tons of pig iron, or 83.9 percent. The blast furnace No. 4 at the Karaganda plant is to be built by 1975. Soviet blast furnace plans reportedly include construction of a 5,000-cubic-meter, 4.1-million-ton-per-year unit during the 1972–75 period.

The second blast furnace for the Rautsruukki steel plant in Finland, which is being supplied by the U.S.S.R., is due to start up in 1973. It will have the same volume (1,033 cubic meters) and capacity (0.7 million tons per year) as the first one. In addition, the U.S.S.R. is supplying sinter facilities and equipment for the continuous casting.

Steel.—In 1971, 76 metallurgical works produced 121 million tons of steel, 4 percent more than in 1970. It is planned to produce 126 million tons of crude steel in 1972, 131 million in 1973, 138 million in 1974, and 146 million tons in 1975. The share of steel produced in oxygen converters increased from 17.2 percent in 1970 to 19.2 percent in 1971, and that produced by open hearth furnaces diminished from 72.6 to 70.6 percent.

At the beginning of 1971, there were 32 operating oxygen converters, of which 25 had capacities of 100 tons or more. Major improvements were realized by increasing the intensity of the oxygen blow. A new 130-ton converter (No. 6, final in shop No. 2), with an annual capacity of 1.4 million tons (total capacity of shops 1 and 2—6.2 million tons) was completed at the Krivoy Rog Lenin plant in the Ukraine on December 31. Construction of the third Linz-Donowitz (LD) unit at the Karaganda plant in Kazakhstan was not completed. Construction of the second shop, with three 300-ton converters, which will have a total annual capacity of 8 million tons, at the Novokuznetsk works in West Siberia began in December. It is planned to build shop 2 (three LD units) at the Azovstal' plant in Zhdsnov, Ukraine, during the 1972–75 period. Dnepropetrovsk design institute completed plans for a LD shop to be built by Soviet engineers in Yugoslavia.

Although several large open hearths (600- to 900-ton capacity) were in operation, the average capacity of all (about 400) Soviet furnaces was approximately 245 tons. In 1971, over 80 percent of open hearth steel was produced with the use of natural gas and over 60 percent with the use of oxygen.

The proportion of steel produced in electric furnaces was relatively low, mainly because of the limited number of furnaces and some of the existing units did not reach rated capacities. The main trend in electric furnace development was toward installation of larger units and increased transformer capacities. Electric furnaces of 100-ton capacity were in operation, and construction of the first Soviet 200-ton unit was completed at the Krasnyy Oktyabr' plant in Volgograd in October. Large furnaces are used for the production of stainless, ballbearing, electrical, structural, alloy, and other special steels. Nearly 80 percent of the electric steel was produced with the use of oxygen.

A direct reduction pilot plant, built by the Moscow Iron and Steel Institute, reportedly operated satisfactorily. It is planned to start industrial production of 95-percent Fe sponge iron in 1975.

In 1971, over 45 million tons of scrap was generated in the U.S.S.R. There is a plan to increase generation of scrap to between 60 and 62 million tons and to construct 30 new and renovate 28 existing scrap processing plants during 1972–75.

Rolled Products.—Soviet rolled output in 1971 totaled 95.8 million tons (of which 84 million tons was finished products), 4 percent more than in 1970. Despite increased total output, production of some structural shapes remained inadequate. As planned output of rolled products is measured in tons, plants prefer to produce heavy types of products and are reluctant to manufacture thin sheet and light sections because this reduces output and labor productivity. Two 250-millimeter wire-rolling mills, at the Krivoy Rog Lenin plant in the Ukraine and the other at the Chelyabinsk plant in the Urals were commissioned in 1971. Under construction was a 1-million-ton-per-year, 1,150-millimeter blooming mill at the Krivoy Rog Lenin plant, a 1,700-millimeter cold-rolling mill at the Karaganda, a new 200,000-ton-per-year cold-rolling mill for electric steel at the Verkhneisetskiy works in the Urals, and a 950/800-millimeter mill at the Orsk-Khalilovo combine in Orenburg Oblast'.

Steel pipe.—In terms of tonnage, the Soviet Union was the largest world producer of steel pipe, with a total of 13.4 million tons in 1971, 7 percent above the 1970 level. The largest pipe had a diameter of 1,220 millimeters. Production of pipe was, however, inadequate to satisfy internal demand, and about 10 percent of requirements had to be imported from West Germany, Sweden, Italy, and Japan.

The tenth electric welding mill at the Volzhskiy pipe plant in Volgograd was commissioned in December. New facilities at the Chelyabinsk pipe plant in the Urals were also completed in December. Pipe manufacture is slated to rise to 14.5 million tons in 1972; estimated levels for 1975 and 1980 are 17 million and 20 million tons, respectively.

Lead and Zinc.—The Soviet lead and zinc industry is probably the second largest in the world. Estimated output of primary metal in 1971 was 650,000 tons of zinc and 450,000 tons of lead. A 11.3-percent increase in zinc output for 1971 was based on increased production at the Almalyk plant in Uzbekistan and "Ukrtsink" plant in the Ukraine. The Ust'Kamenogorskiy and Leninogorsk complexes, Chimkent lead plant, and some other lead and zinc plants experienced raw material shortages in 1971, and the quality of the concentrates supplied by the Zyryanovsk, Leninogorsk, and other concentrating plants was not always satisfactory and several percent below planned metal content.[29] Neither lead nor output quotas were reached in 1971 nor in previous years owing to the slow construction of new facilities and low metal recoveries.[30] There is a plan to enlarge and renovate existing lead and zinc plants during the 1972–75 period. Estimated production of primary metals in 1975 is placed at 700,000 tons for zinc and 500,000 tons for lead; estimated levels for 1980 are 800,000 and 560,000 tons, respectively.

In 1971, Soviet experts participated in a Bolivian zinc reserve evaluation study, which will be the basis for possible construction of a zinc smelter by the U.S.S.R.

Kazakhstan continued to be the leading producer of lead and was second, after the Urals, as a producer of zinc. Most of the lead and about 70 percent of the zinc were smelted with oxygen-enriched systems.

Development of the large Glubokiy underground mine, of the Achisay polymetallic combine, was completed in December. This mine will supply raw material to the Chimkent lead plant. The Tsentral'naya underground mine of the Zyryanovsk lead combine was under development in 1971. It is planned to increase the lead and zinc ores output at the Tekeliyskiy and Kaskaygyr-Akdzhal'skiy mines and to put into operation the Karagalinskiy combine, the Tishinskiy underground mine and two sections of the Zharemskiy mine in Kazakhstan during the 1972–75 period.

The first stage of the large zinc plant at Almalyk in Uzbekistan, which went onstream in 1970, reached planned capacity at 3 million tons of lead-zinc-barite ores per year in December. Completion of the second stage is scheduled for either 1972 or 1973. Development of the Nikolayevskiy mine at the Sikhali polymetallic combine in Maritime Kray has continued, and its shafts will be almost 1,000 meters deep. The first Georgian S.S.R. nonferrous enterprise, the Madneuli mining and concentration combine, which will exploit the copper-lead deposits around Bolnisi, was under development and completion is scheduled for 1975.

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[29] Kazakhstanskaya pravda (Alma-Ata). Oct. 5, 1971, p. 2; Narodnoye khozyaystvo Kazakhstana (National Economy of Kazakhstan), Alma-Ata. No. 6, June 1971, pp. 32–36.

[30] Tsvetnyye metally (Nonferrous Metals), Moscow. No. 9, September 1971, p. 4; Narodnoye khozyaystvo Kazakhstana (National Economy of Kazkhstan), Alma-Ata. No. 12, December 1971, pp. 86–87.

Magnesium.—Five magnesium plants, with a combined annual capacity of about 60,000 tons, produced an estimated 52,000 tons in 1971, 4 percent more than that of 1970. The Solikamsk magnesium works in the Urals was experimenting with two new types of electrolysis plants to overcome the problems associated with low-grade carnelites. Magnesium production is slated to rise by 4 percent in 1971. Deliveries of Soviet magnesium to Western European markets have taken on more regularity over the past 2 years.

Manganese.—The Soviet manganese industry remained the largest in the world, with an estimated output of marketable ores at 7 million tons. Estimated production levels for 1975 and 1980 are 9 million tons and 11 million tons, respectively. Run-of-mine ore output in 1971 was over 17 million tons, of which 75 percent came from the Nikopol' basin in the Ukraine; next largest was the Chiatura basin in Georgia. Exports of manganese ore increased from 13 percent in 1966 to over 19 percent of total production in 1971. It is planned to mine some 22 million tons of crude ore by 1975.

There were 18 underground and 10 open pit mines, with 8 concentration plants in operation in the Nikopol' Basin in 1971, where the ore averages 26.4 percent. Of the concentrates, 45 to 48 percent had a manganese content of over 45 percent, the balance containing 34 percent. More than 70 percent of ore mined in the Nikopol' Basin was open pit production. The second stage of the Chkalovskiy No. 1 open pit mine at the Ordzhonikidze combine in the Nikopol' Basin, which has a capacity of 1.2 million tons of crude ore, went onstream in December. Development of the No. 9/10 underground mine of the Marganets combine, the largest in this basin, with an annual capacity of 1 million tons of crude ore, began in July.

There were 20 underground and open pit mines with eight concentrators in the Chiatura manganese basin in 1971. Ore grades averaged 23 percent. Of the Chiatura output, 66 percent contained 48.7 percent manganese, the balance contained 25.6 percent. Approximately 80 percent came from underground methods. New production facilities, with a total annual capacity of 650,000 tons of crude ore, were under development at several mines, and the second stage of the central flotation plant was under construction.

Mercury.—Mercury output in 1971 was estimated at 50,000 flasks (76 pound), sufficient for domestic demand. The Khadarkan combine in Kirghzia, the largest Soviet mercury enterprise, had four mines and a recovery plant in operation in 1971. The Nikitovskiy combine in the Ukraine was the second major producer. Construction continued on the Dzhidzhikrutskiy underground mine and recovery plant in Tadzhikistan, scheduled for completion by 1975. It is to be the chief Soviet supplier of mercury and antimony.

In the Ukraine, planning began for the Zakarpatskiy mercury combine, which will process ores from the Borkutnoye, Shayanskoye, and other small deposits in Zakarpatskaya Oblast'. In 1975, mercury output from the Zapadno-Polyanskoye and Plamennyy deposits in Magadanskaya Oblast' is expected to be 32.4 percent higher than in 1970. It is planned to start development of explored mercury deposits in North Caucasus, Azerbaydzhan, and Kemerovo Oblast' in West Siberia.

Molybdenum.—Metal content of molybdenum concentrate output was estimated at 8,000 tons, about 4 percent above that of 1970. About 50 percent came from copper-molybdenum ores in Armenia, Kazakhstan and Sorskoye and others in Siberia; over 30 percent was from molybdenite ores mined in Uzbekistan and at Umaltinsk and Chikoysk in Siberia; the remainder came from the tungsten-molybdenum ores of Tyrny-Auz (Kabardin A.S.S.R. in North Caucasus) and Dzhida (Buryat A.S.S.R.). Soviet reserves of molybdenum in ore may approach 200,000 tons.

Armenia is the major producer of concentrates which are shipped out of the republic for further processing. The Kadzharan copper-molybdenum combine supplied 25 percent of Soviet molybdenum in 1971. Output of molybdenum concentrate at this combine is to be increased by 20 percent in 1975. Uzbekistan occupies one of the leading places in the U.S.S.R. in the production of molybdenum concentrates.

The molybdenum concentrator of the Balkhash metallurgical complex in Kazakhstan and the Dzhidinsk tungsten and molybdenum combine in Buryat A.S.S.R. increased output of molybdenum concentrate in 1971. The Tyrny-Auz tungsten-molybdenum combine in Kabardin A.S.S.R. was being enlarged in 1971. The Vostochnyy open pit mine was put into operation at this combine in 1971. A new small complex in Chita Oblast', East Siberia, is under construction, scheduled for completion in 1975.

Nickel.—With an estimated 120,000 tons of smelter production, 8 percent more than that of 1970, the Soviet nickel output is second only to that of Canada. There is a plan to increase production of metal by 4 percent in 1972. The centers of production, in order of importance, continued to be Norilsk, in West Siberia, the Southern Urals, and the Kola Peninsula. Six smelters were in operation in 1971; at Norilsk, Rezh, Ufaley, and Khalilovo in the Urals, and Monchegorsk and Pechenga in the Kola Peninsula. Production is estimated at a probable 140,000 tons in 1975 and 175,000 tons in 1980.

The U.S.S.R. was negotiating with French, British, and Japanese companies for joint development of the Buruktalsk nickel deposit in the Southern Urals. The experimental shop at this deposit was commissioned in August. It is intended to develop the technology of the electric smelting of ferronickel from oxidized ores. The Soviets have difficulties in efficient treatment of their ores because of low technological level. The Soviet Union is an important nickel exporter and trades directly with the International Nickel Co. in large annual negotiated deals. On November 30 in Moscow, American manufacturers of mining and drilling equipment signed the $125 million trade agreement with the Soviet Union. The deal provides for the purchases of 50 million tons of nickel beginning in 1972.

During the 1966–70 period, nickel output at Yuzhuralnikel complex rose by 36.8 percent. Construction of a new 1,000-million-ruble nickel plant at Norilsk began in March, the first stage scheduled for completion in 1974. By 1975, Norilsk output is to be increased by 60 percent over the 1970 level. In the Ukraine, the Pobuzhskiy Soviet's first ferronickel plant was under construction, the first stage scheduled for completion in July, and the second in December 1972. But the management experienced considerable difficulty in completing this project on schedule because of shortages of labor, materials, and equipment.[31]

Platinum.—The U.S.S.R. remains the largest platinum-group metals producer and exporter, supplying 20 to 25 percent of international exports of platinum, 70 to 75 percent of palladium, and 60 to 70 percent of rhodium, with reserves adequate to maintain current production for many years. Production came principally from the Norilsk copper-nickel mines, with additional output from the Kola Peninsula combines and several placer deposits in the Urals. Almost all of the platinum-group metals were produced as byproducts, about 75 percent coming from Norilsk.

The U.S.S.R. is steadily expanding its output of platinum-group metals, with 1971 output estimated at 2.3 million ounces. Primary production is forecast to increase at an annual rate of 3 to 5 percent. Production of primary platinum and platinum-group metals may reach 2.75 million ounces by 1975 and 3.5 million ounces by 1980. The Talnakh and Oktyabr'skiy deposits in Norilsk will be the main production centers.

According to Metal Bulletin,[32] Soviet sales of platinum during 1971 had increased from an average annual level of around 250,000 to 300,000 ounces to approximately 550,000 ounces. This increase could probably be accounted for by sales from a stockpile.

Two open pit and one underground mine were in operation at the Norilsk sulfide deposits, where the ore averages 0.75 percent Cu, 0.5 percent Ni, and up to 11 grams per ton platinum-group metals—mainly palladium and platinum. Ore at the Talnakh deposit averages about 3 percent Cu, 1.5 percent Ni, and up to 11 grams per ton platinum-group metals. The Mayak underground mines, in operation at Talnakh, produced 66 percent of the Norilsk output in 1971.

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[31] Sotsialisticheskaya industriya (Socialist Industry), Moscow. Nov. 11, 1971, p. 2.

[32] Metal Bulletin (London). No. 5,677, Feb. 18, 1972, p. 16.

Development progressed at the Talnakh mining combine; and the Mayak mine was approaching planned capacity. At the Komsomol'skiy mine completion of the first stage was rescheduled to 1972. Development continued at the Oktyabr'skiy deposit where the ore averages 3.5 percent Cu, 2.5 percent Ni, and up to 11 grams per ton platinum-group metals. The ore output at Norilsk, Talnakh, and Oktyabr'skiy deposits in 1975 should increase 60 percent over that of 1970, according to plans.

At Monchegorsk the ore averages about 0.7 percent Ni, 0.4 percent Cu, and some precious metals. Kola ores were mined by both open pit and underground methods, and the Zhdanovskiy mining and concentrating combine is the largest in this area. The second stage of the Zhdanovskiy concentration plant at the Severonikel combine was in progress, and construction of the new crushing plant of the Pechenganikel complex neared completion. The Urals in 1971, produced about 2 percent more placer platinum than in 1970.

Silver.—Almost all silver was produced as a byproduct of lead, zinc, and copper ores. Production in 1971 was mainly centered in the Urals, Kazakhstan, East Siberia, the Soviet Far East, and Armenia. During the year, 14 gold treatment plants extracted silver. The Norilsk complex and some of the Kola copper-nickel enterprises also produced silver.

The Sikhali combine in Maritime Kray and the Achisay lead-barite center in Kazakhstan were the largest producers of silver in 1971. The recovery of silver in beneficiation plants in the Urals varied from 16 to 50 percent from complex ores containing 6 to 15 grams of silver per ton.

Tin.—Although Soviet policy is based on tin self-sufficiency at any price, estimated output at 38,000 long tons was inadequate to meet demand, and about 20 percent of the requirements were imported in 1971, including the first shipment of tin from Bolivia.

Soviet geological tin reserves are estimated at about 800,000 tons of metal content. Nevertheless, there are shortages of explored reserves at many enterprises.[33] The average content in ore varies from 0.6 to 1.0 percent tin. The Ministry of Geology carried out intensive exploration programs, and new small deposits were reported.

Construction by Soviet engineers of a volatization plant at Potosi in Bolivia is expected to start in 1972. This will be the first of several plants the U.S.S.R. will construct in Bolivia under proposed agreement.

Soviet tin development was mainly in Maritime Kray (the principal center), Magadanskaya Oblast', Khabarovsk Kray, Yakutia, and Transbaykal. Three known tin refineries were operating during the year, Novosibirsk, Ryazan', and Podol'sk, which is near Moscow. Concentrates from Siberia and the Soviet Far East were shipped to Novosibirsk. In 1971, about 30 percent of output came from placer deposits, which accounted for 75 percent of output from the Soviet Northeast.

In Maritime Kray, the largest producer, expansion of the Khrustal'nyy mining and concentrating combine was continued. Renovation of the Taezhnaya concentrating plant at this combine was completed in August, and its capacity is to be increased by about 40 percent. Development of the Ternistyy mine of this combine continued in 1971. In Khabarovsk Kray, the second stage of the central concentrating plant of the Solnechnyy mining and concentrating combine was commissioned in August. The plant's capacity is to be doubled after the second stage becomes fully operational. However, the recovery of the metal in concentrate is low, and the ore reserves at this combine are much less than originally estimated during exploration of deposits several years ago.[34]

Titanium.—With an estimated 13,300 tons, 7 percent more than that of 1970, the U.S.S.R. was the world's second largest producer of titanium in 1971. Large amounts of titanium are now sold to the United States and other countries. Soviet reserves of TiO_2 have been estimated at about 10 million tons, contained in 70 million tons of ore averaging 10 to 20 percent TiO_2. During the 1971–75 period, a 40-percent increase in output is expected and exports will increase significantly.

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[33] Razvedka i okhrana nedr (Exploration and Conservation of Natural Resources), Moscow. No. 5, May 1971, p. 9; No. 3, March 1972, p. 1.

[34] Tsvetnye metally (nonferrous Metals), Moscow. No. 9, September 1971, p. 4.

The industry is based principally on Ukrainian and Siberian ilmenite and rutile and on titaniferous magnetites and ironstone located in the Central Urals, the Kola Peninsula, and Karelia. Development continued in the Ukraine, the center of titanium production. Major producers were the Samotkansk zirconium alluvial deposits and the Volchansk deposit in Dnepropetrovsk Oblast' and the Irshanskoye, Streminogorskoye, and Zelenogorskoye deposits in Kievskaya Oblast'. Two mining and concentrating combines, Verskhnedneprovskiy and Irshanskiy, operated these deposits in 1971.

The capacities of these combines, as well as the capacities of Soviet titanium-magnesium plants, are steadily growing and the quality of products is improving. The renovation of the Ust'-Kamenogorsk titanium-magnesium complex has made it possible to reach planned production levels. The output of titanium sponge is to increase by 15 percent before the end of 1972. The Nos. 3 and 4 concentrators in Irshansk and the largest Soviet titanium dioxide plant in the Crimea continued under construction during the year.

Tungsten.—Production in tungsten in concentrate (contained tungsten) was estimated at 7,000 tons, 5 percent more than that of 1970. Development was concentrated in the North Caucasus, the Soviet Far East, Transbaykal, Central Asia, and Kazakhstan. More than 80 percent of the tungsten produced was allocated to the ferrous metals industry. Up to 18 percent was used in ferroalloys and 2 to 5 percent in the electrical industry. Geological reserves of tungsten ores may be as large as 500,000 tons of 60 percent WO_3.

The sixth section of the Tyrny-Auz tungsten and molybdenum combine in Kabardin A.S.S.R. (North Caucasus), was being built; the Vostochnyy open pit mine of this combine, where the deposit averages up to 1.3 percent WO_3, went onstream in July. In the north of Maritime Kray, construction continued on the Primorskiy tungsten combine at the Vostok-2 deposit. The first stage of this combine has been rescheduled to start up in 1972. There are plans to build a second beneficiation plant at the Dzhidinskiy tungsten and molybdenum combine in Buryat A.S.S.R., where the development of the Inkurskoye deposit began in 1971.

Exploration of the Bom-Gorkhonskoye tungsten deposit in Chita Oblast' was completed. The Bogutinskoye tungsten deposit in Kazakhstan was under exploration in 1971.

Vanadium.—The Soviet Union, with large resources, is becoming an important vanadium producer. The principal sources in 1971 continued to be vanadium-rich slag from the Kachkanar titaniferous magnetite in the Urals and from Lisakovsk iron ore (0.6 percent V) in Kazakhstan. However, the metallurgical problems of vanadium recovery have not yet been satisfactorily resolved, and rated vanadium recovery has not been achieved.

The second stage of the Kachkanar pellet plant, with a designed capacity of 2.8 million tons of pellets, and the Lisakovskiy combine were under construction. A new plant for the production of ferrovanadium from Urals magnetite ore was reportedly under construction at the Serov steel plant in the Urals.

Other Metals.—*Byproducts.*—All the arsenic output in 1971 was obtained as a byproduct from the smelting or roasting of metallic ores. Numerous arsenic deposits exist in the U.S.S.R., including realgar-auripigment, arsenopyrite, arsenic gold, and polymetallic. Bismuth is recovered from complex ores such as tungsten-molybdenum-bismuth ores of the North Caucasus and scheelite and cassiterite ores of Kazakhstan and Siberia. Cadmium is produced at a number of Soviet lead and zinc smelters. In 1971, the Ust-Kamenogorsk lead-zinc complex and the Chimkent lead plant in Kazakhstan increased cadmium production by several percent.

Rare Metals.—The Soviet Union possesses commercial deposits of all those rare metals that have assumed importance in modern rocketry, aircraft, and atomic energy. However, extraction of many of them remains low.

Known resources of rare metals are sufficient to satisfy the needs of the 1971–75 5-year plan, but prospecting still lags behind the potential of the main producing regions of the Soviet Union. The most important deposits of rare metals are in Kazakhstan, Kola Peninsula, Urals, Ukraine, Norilsk, Transbaykal, and the Soviet Far East. The growth in the quantity index exceeded the growth of the quality indexes, and the extraction of many rare metals was very low. For example, only 40 to 50 percent of selenium and tellurium and 60 to 70 percent of rhenium were extracted in Armenia in 1971.[35]

Byproduct gallium is recovered from raw materials used to produce aluminum. In the current 5-year plan period, Kazakhstan will become an important producer of gallium.

The new Soviet semiconductor materials industry was meeting the demands of its indigenous customers and beginning to export germanium and silicon. Kazakhstan is the main producer of tellurium in the U.S.S.R.

By 1965, selenium and tellurium extraction had been organized at the Norilsk complex. The main centers of selenium and tellurium extraction from copper refinery slimes continued to be the Kazakhstan, Norilsk, and Kola complexes. Selenium is also produced in Kazakhstan, the Urals, and Armenia. The Ust'-Kamenogorsk lead and zinc complex increased product of tellurium by several percent.

The Balkhashskiy copper smelting complex in Kazakhstan first recovered rhenium salts from reprocessing molybdenum plant products and from sulfuric acid washings in 1966 and, by 1971, had increased output substantially. Molybdenum deposits of Armenia (Kadzharan, Agarak, Dastakerts, and others) were important for the production of rhenium. An installation to extract this metal was under construction at the Kadzharan combine.

The bulk of tantalum and columbium is in pyrochlore (Kola Peninsula and the Urals), obruchevite (Kola Peninsula and the Ukraine), and in hatchettolite (Kola Peninsula, Khiba, and elsewhere). Newly discovered deposits of low-grade tantalum-columbium ores in granites also contained other rare metals, and the growing need for tantalum necessitates processing ores and concentrates with very low tantalum content. However, there is great difficulty in processing these materials. The Orlov mining and concentrating combine in Chita Oblast', East Siberia, was under construction. A pilot plant for the chemical extraction of tantalum, which was put into operation at this combine in 1969–70, increased production of tantalum in 1971. The Belogorskiy mining and concentrating combines in Kazakhstan increased production of tantalum in 1971.

Several units exploited zircon alluvial deposits in 1971. One of the largest is the Samotkanskoye zircon deposit in Dnepropetrovsk Oblast', Ukraine. The Verskhnedneprovskiy combine, brought into operation in 1961 to mine this deposit, increased output of zircon concentrate in 1971.

A new industrial complex was under construction at the Solikamsk magnesium works and production of semifinished products of rare earth elements started at this plant in 1971.

NONMETALS

The Soviet Union produced a great variety of nonmetals, but the nonmetal mineral resource position varies from adequacy of many nonmetals to an apparent shortage of barite, feldspar, mica, and talc.

Asbestos.—In 1971 total production of the six grades of asbestos produced by the Soviet Union was estimated at 1.15 million tons, about 10 percent more than that of 1970. Production was second only to Canada. Exports rose from 346,500 tons in 1969 to 385,300 tons in 1970, and to an estimated 410,000 tons in 1971, approximately two-thirds going to Western markets. In spite of asbestos export expansion in recent years, the domestic asbestos deficit reached 200,000 tons in 1971 and is planned to be about 100,000 tons by 1975.[36] The 1971–75 5-year plan foresees an increase in new capacities of 605,000 tons and a rise in production of 563,000 tons by completion of the second stages of the Dzhetygara (400,000-ton capacity) and Tuvaasbest (205,000-ton capacity) combines by 1975. Estimated output for 1975 and 1980 are 1.45 million and 1.7 million tons, respectively.

Asbestos industry development was concentrated in the Urals, Kazakhstan, and Tuva A.S.S.R. Output of chrysotile asbestos at the Uralasbest combine was estimated at 835,000 tons. In Kazakhstan, the first stage of the Dzhetygara asbestos combine produced about 280,000 tons in 1971; a second stage is now rescheduled for completion in 1972–73. The first stage of Tuvaasbest combine at Ak-Dovurak in Tuva A.S.S.R. produced an estimated 35,000 tons in 1971; the second stage of this combine was also rescheduled for completion in 1972–73.

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[35] Promyshlennost' Armenii (Industry of Armenia), Yerevan. No. 7, July 1971, p. 7.

[36] Narodnoye khozyaystvo Kazakhstana (National Economy of Kazakhstan), Alma-Ata. No. 12, December 1971, p. 89.

Construction of the first stage of the Kiembay asbestos combine in Orenburg Oblast' continued. There are plans to develop the Molodezhnoye and Il'chirsk chrysotile asbestos deposits in Buryat A.S.S.R. in the future.

Barite.—Barite was mined both by open pit and underground methods and at some operations crude output was upgraded by flotation. About two-thirds of the 1971 consumption was produced domestically, the balance being filled by high-grade imports. The main center of production continued to be Georgian S.S.R. Some deposits have been developed in West Siberia, the Urals, Kazakhstan, Azerbaydzhan, and Armenia. Over 30 percent of the Soviet reserves are located in Georgia, which produced over 70 percent of the 1971 output. The increased output in 1971 was attributed largely to completion of new facilities in Georgia and the completion of a barite section at the Kentau concentrating mill in the Achisay complex Kazakhstan.

A new ore mining section, with an annual capacity of 45,000 tons of barite concentrate, was under development at the Chordskoye barite deposit in Georgia. It is planned to put this section into operation in 1972.

Cement.—Approximately 110 plants (including 83 plants under the Ministry of Construction Materials) produced 100.3 million tons of cement, or about 5.4 percent more than in 1971. There were 359 kilns, including 23 185-meter and 35 170-meter rotary kilns, in operation in 1971. Plans called for the construction of 3.6 million tons of new capacity in 1971, but only 2.8 million tons of the total was completed. The planned construction costs of a cement plant with an annual capacity of 0.6 million tons was about 20 million rubles. As a result of poor-quality cement and inefficient transportation of the cement, about 10 percent of the total production was wasted in 1971.[37]

Production is slated to rise to 103.4 million tons of cement in 1972 and 125 million tons in 1975. It is estimated, however, that production in 1975 will probably not be more than 120 million tons.

Soviet cement plant capacity (under the Ministry of Construction Materials) in 1966–70 and planned additional capacity for 1971–75 follow in million tons:

1966–1970 actual		1971–1975 planned	
Year	Capacity	Year	Capacity
1966	3.9	1971	3.6
1967	2.3	1972	4.3
1968	2.8	1973	6.2
1969	1.9	1974	11.5
1970	5.5	1975	6.0
Total	16.4	Total	31.6

Source: Tsement (Cement), Moscow, No. 1, January 1971, p. 2.

Clays.—*Bentonite.*—Output of bentonite in the U.S.S.R. in 1971 was at about the 1970 level. Armenia, Tadzhikistan, and Kazakhstan were the three principal centers of production. A bentonite production combine was under construction at Idzhevan in Georgia and development of the Dashsalakhly bentonite deposit in Azerbaydzhan began in 1971. Completion of the first stage of the Izhdevanskiy combine was rescheduled for 1972.

Diamond.—The U.S.S.R. continued to make rapid progress in expanding its diamond industry, which is centered in Yakutia, where about 20 diamond deposits have been discovered. Production of diamond in this region started at a small concentrating plant in 1957. On January 1, 1972, the industry consisted of the large mechanized Mirnyy open pit mine and five concentrators, the Aykhal open pit mine and one concentrator, the Udachnaya placer mine (near the Arctic Circle) and one concentrator, and the Irelyakh placer mine with two dredges. In 1971, production was estimated to be roughly 7 million carats of industrial quality and about 1.8 million carats of gem stone, mainly from the previously mentioned deposits. Small quantities of gem and industrial stones were produced from the Vishera River region in Perm Oblast', Western Urals, where four dredges, and two separation plants were operated at two placer deposits in 1971.

By 1970, Yakutia's diamond output was to be increased by about three times the 1965 level. Two more concentrating mills were to be built, at Aykhal and Udachnaya, to process deeper horizons. But the second stage of No. 8 concentrator at the Aykhal open pit mine and the No. 11 plant at Udachnaya open pit mine were rescheduled to start up in 1972. Development of the Internatsional'naya deposit near Mirnyy began in May.

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[37] Material'no-technicheskoye snabzheniye (Material-Technical Supply) Moscow. No. 6, June 1971, p. 55.

Gem stones are being cut at Leningrad, Sverdlovsk, and Smolensk. Sales of cut diamond are rising steadily and substantial increases are expected to start in 1975–76.

A substantial but unknown quantity of synthetic diamond was also produced in 1971 by plants in Kiev, Yerevan, Moscow, and Tashkent.

Fertilizer Materials.—Production totaled 14.7 million tons in nutrient content, or 61.4 million bulk[38] tons in 1971, an increase of 11 percent over 1970. Exports increased in 1971, but despite a substantial rise in production and exports, fertilizers were in short supply, and the quality of the product of certain enterprises continued to elicit complaints.

The planned production was not attained at many enterprises. For example, the Uvarovo plant in Tambov Oblast' was run at only 33 percent of capacity, the Almalyk plant (Uzbekistan) at 51 percent, Rustavi (Georgia) at 51 percent, and Kirovakansk at 60 percent; the utilizations for 1972 are expected to be 48, 54, 69, and 71 percent, respectively. Labor productivity was low. For example, the Karatau plant employed 6,500 workers and produced 4.2 million tons of phosphorite, containing 28.5 percent P_2O_5.

New plants and expansions with an annual capacity of 3 million tons in bulk were commissioned during the year. New facilities put into operation included those at the Grodnenskiy (Belorussia), Navoyskiy (Uzbekistan), and Novo-Kemerovskiy (Siberia) complexes, the Uvarovskiy (Tambov Oblast') and Konstantinovskiy (Donets Basin) plants, and the Rovenskiy (Ukraine) and Ionavskiy (Lithuania) nitrogen fertilizer plants. Only 12 units out of a total 19 were commissioned in 1971.

The 1971–75 plan envisages output of 90 million tons (22.2 million tons of nutrients) in 1975 with the total capital investment for the chemical industry of 17.2 billion rubles, or an increase of 93 percent over investments in the last 5-year plan. Estimated levels for 1975 and 1980 are 85 million tons and 115 million tons, respectively. New fertilizer capacity of around 35.2 million tons per year is to be started by 1975.

In 1970, 45.7 million tons of fertilizers were delivered to farms in the U.S.S.R.; the ninth 5-year plan for 1971–75 calls for 72 million tons of fertilizer to be delivered by 1975.

Phosphate.—Increased output of phosphate fertilizers in 1971 was attained largely through the commissioning of new capacity rather than greater use of available facilities. Single superphosphate continued to be the basic type of phosphate fertilizer produced.

Estimated output totaled 48 million tons in 1971, including 28 million tons of apatite (17 to 18 percent P_2O_5) and 20 million tons of sedimentaries (13 percent P_2O_5). The main centers were the "Apatit" combine on the Kola Peninsula and phosphate deposits of Karatau in Kazakhstan, Kingisepp in Leningrad Oblast', Yegor'evsk and Lopatino in Moscow Oblast', and Upper Kama in the Urals. Apatite concentrate with 39.4 percent P_2O_5 provided over 80 percent of all raw materials for the production of phosphate fertilizers. A high percentage of superphosphate is still not granulated, and great difficulties have been experienced with double superphosphate production at Voskresensk, Volkhov, and other plants. The phosphate geological reserves were estimated in 1971 at 2,717 million tons of phosphorite (overall average grade 13.8 percent P_2O_5) and 2,700 million tons of apatite (average grade 18.5 percent P_2O_5).

The Soviet Union is to place particular emphasis on increasing production of phosphate and potash fertilizers in the period 1971–75. Phosphate fertilizer production in 1975 is to total 22.1 million tons, compared with 13.4 million tons in 1970. The Karatau deposit is to provide 27.5 percent of the phosphate raw material in 1975, compared with 18.3 percent in 1970; the apatite contribution is to fall from 81.7 to 69.6 percent. New phosphate fertilizer capacity totaling 16.4 million tons is to be installed during 1971–75.

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[38] The active ingredients, nitrogen, phosphorous, and potash, are expressed in terms of Soviet standard units, which are not the same as used in the United States. Nitrogen is expressed as ammonium sulfate, 20.5 percent N; phosphate is expressed as 18.7 percent P_2O_5; potash is expressed as 41.6 percent K_2O; and ground rock phosphate (phosphatic flour) is expressed as 19 percent P_2O_5.

The structure of phosphate fertilizer production is to change during the 1970–75 period as follows (in million bulk tons):

	1970 actual	1975 planned
All mineral fertilizers	55.4	90.0
Including:		
Ground rock phosphate (phosphatic flour)	5.7	5.4
Phosphate fertilizers	13.4	22.1
Of these:		
Ordinary fertilizers:		
Single superphosphate	8.5	7.8
Double superphosphate	2.8	5.6
Basic slag	.3	.2
Total	11.6	13.6
Complex fertilizers:		
Monoammonium phosphate	.5	4.2
Diammonium phosphate	--	(1)
Ammonium phosphate	.3	2.3
Nitrofoska	.3	.4
Nitrophosphate	.4	1.6
Total	1.5	8.5

[1] Less than ½ unit.

The 1971–75, 5-year plan envisages commissioning of new facilities for the production of 1.6 million tons of apatite concentrate and 10.8 million tons of apatite-nepheline ore and to ensure an output of 14.5 million tons of apatite concentrate per year, and allocation of 250 million of capital investments at the Apatit complex. During the 1970–75 period, the Karatau combine in Kazakhstan is to build and put into operation the new facilities for production of 5.6 million tons of marketable phosphate ore (6.9 million tons of crude ore) and 0.65 million tons of fine ground phosphate raw material.

There are plans to allocate the following capital investments during the 1970–75 period: the Kingisepp "Fosforit" combine, 18.5 million rubles; Upper Kama phosphate deposit, 16 million; and Bryansk phosphatic flour plant, 12 million rubles.

Potassium.—The U.S.S.R. is a leader in potassium reserves, fertilizer output, and exports of potash salts. Gross reserves are reported at 19,600 million tons of 16 to 40 percent K_2O content. About 70 percent of the reserves are located at the Upper Kama basin in the North Urals. Estimated 1971 output of potash was 11.6 million tons (41.6 percent K_2O) around 10 percent higher than 1970. The four major producers are Solikamsk and Berezniki on the western side of the Urals, Soligorsk in Belorussia, and Stebnikov and Kalush in West Ukraine. Eight combines were in operation in 1971.

Under the 1971–75 5-year plan, output of potash is to increase from 9.6 million tons (41.6 percent K_2O) in 1970 to 19.8 million tons in 1975. The Uralkaliy (Urals potash) concern is to increase production of potash salts from 3.8 million tons to 10.8 million tons; the Belaruskaliy concern, during 1971–75, is to raise production of potassium chloride from 4.8 to 8 million tons per year; and the Kalush chemical-metallurgical complex is to increase the output of fertilizers from 382,000 tons in 1970 to 500,000 tons (41.6 percent K_2O) in 1975. Construction is planned for 4 more combines during the 1972–75 period. Estimated levels of potash output for 1975 and 1980 are 15 million tons (41.6 percent K_2O) and 20 million tons, respectively.

Capital investments in the potassium industry for the next 5 years have been set at the following levels, in million rubles: the Uralkaliy concern, 450; Belaruskaliy concern, 102.15; and the Stebnikov combine, 24.72.

The three existing potassium combines in Soligorsk, Soligorsk Nos. 1–3 and the fourth one under construction, were united into one concern, the Beloruskaliy, in 1971. The Solikamsk combine and both operational combines (Nos. 1 and 2) in Berezniki and the Berezniki No. 3 under construction have also been united into one concern, the Uralkaliy.

Nitrogen.—Nitrogen production was expanded from 26.4 million tons in 1970 to an estimated 29.5 million tons in 1971, 3.1 million tons more than that of 1970. The bulk of the production was in the form of ammonium sulfate and ammonium nitrate fertilizers, although production of urea and liquid fertilizers has increased. Estimated levels of nitrogen production for 1975 and 1980 are 33 million tons (20.5 percent N) and 41 million tons, respectively.

Five ammonia plants, Nevinomysk, Novomoskovsk Nos. 1 and 2, Severodonetsk, and Novgorod, each with an annual capacity of about 450,000 tons, equipped by the M. W. Kellog Co., New York, and the Tayo Engineering Corp. (TEC) of Japan, were under construction in 1971. Under a new contract worth $21 million signed on November 29 in Moscow, TEC will provide services for procurement of equipment and machinery for four new ammonia plants.

Fluorspar.—Despite the Soviet Union's efforts to achieve self-sufficiency, the U.S.S.R. was still a net importer of fluorspar with imports from Mongolia, Japan, People's Republic of China, and other countries. Imports of fluorspar increased from 102,000 tons in 1968 to 144,700 in 1970 and to an estimated 150,000 tons in 1971. Consumption of fluorspar in 1971 was estimated at 570,000 tons; the iron and steel industry accounted for more than three-quarters of the total.

Fluorspar was mined in Maritime Kray (Voznesensk deposit), Chita Oblast' (Kalanguev, Abagaytuysk, Solnechnoye, and Usuglinsk deposits), Buryat A.S.S.R., Central Asia, and other regions. The first plant in the U.S.S.R. for production of fluorspar pellets, with a designed capacity of 20,000 tons per year, was under construction in Transbaykal. The newly discovered Shakhterskoye fluorspar deposit in Irkutsk Oblast' is to be used as a base for establishing a large mining and concentrating combine.

Mica.—Soviet mica consumption is expected to increase during the 5-year plan period, and neither present reserves nor existing capacity for mica production can satisfy these needs. Strategic-grade mica continues to be imported from India for special industrial demands. As in prior years, almost 75 percent of all muscovite mica production continued to come from Mamsko-Chuyskiy county of Irkutsk Oblast'. Mica was also mined in Yakutsk A.S.S.R., Karelo-Murmanskiy region, and elsewhere. At the Kuru-Vaarskoye deposit, Enskoye mine in the Kola Peninsula, all types of mica were produced in 1971. The Irkutsk, Filinsk, and Kireyevsk mica plants increased production by several percent in 1971.

Refractories.—As in previous years, production of refractories paced rising industrial output, but the consumers were not satisfied with the quality of the products. The refractory industry, however, continued to direct its major efforts toward quantity in 1971, rather than quality of products.

The Shorzha refractory combine on the shore of Sevan Lake Armenia, on the site of large reserves of magnesium silicate rocks was under construction. The first stage of the combine was rescheduled for completion in 1972.

Salt.—The Donets Basin accounted for over 40 percent of the salt output in 1971. A large mine, with a capacity of 2 million tons per year, was being developed in Salarinsk county, Irkutsk Oblast'. Reportedly, in order to operate the mine at full capacity, approximately 4,000 workers will be needed. Development of a new mine, with an annual capacity of 2 million tons, began in Artemovsk, Donetsk Oblast' in 1971.

Sulfur.—The Soviet Union is one of the leading countries with respect to sulfur reserves, but sulfur content is low and production costs high. The principal commercial deposits are at Rozdol and Yavorov (West Ukraine), Gaurdak, Shorsu, and others (Central Asia), and Alekseyevsk and Vodninsk (Volga group). Exports of elemental sulfur increased from 362,500 tons in 1969 to 463,800 tons in 1970 as a result of large shipments to Czechoslovakia, Cuba, and other Communist countries. Exports of pyrite increased from 1.5 million tons to 1.8 million tons, mainly to Italy and West Germany. Exports of sulfuric acid increased from 155,600 tons in 1969 to 214,600 tons in 1970.

The Rozdol chemical and ore combine near L'vov, West Ukraine, was the U.S.S.R.'s largest producer of sulfur. The Gaurdak, Turkmenia, was one of the four exploited deposits of natural sulfur in Central Asia, which, together with the Rozdol deposit, provided the bulk of the country's requirements.

Other sources of sulfur were also receiving attention. These included recovery in the form of sulfuric acid from nonferrous smelter gases and from oil processing. Construction of a large combine for sulfur production continued at the Yavorov mining and chemical combine in L'vov Oblast'. A pilot installation was put into operation using the Frasch process at the Gaurdak combine in March. This experimental installation is to be put on an industrial basis, and its first stage is to be commissioned in 1974. Output of sulfur at the Gaurdak combine is to increase by 30,000 tons in 1972.

Production of sulfuric acid was begun at several nonferrous metal smelters in 1971. The sulfuric acid plant at the "Krasnyy Khimik" complex in Leningrad accounted for almost two-thirds of the total Soviet production of sulfuric acid.

The U.S.S.R.'s increase in sulfuric acid capacity continued to rely heavily on imports of Polish equipment and technology. According to an agreement signed on December 22, Poland will supply the Soviet Union with two sulfuric acid plants, each with a 360,000-ton-per-year capacity. Poland has already delivered 16 sulfuric acid units to the U.S.S.R.

Talc.—The U.S.S.R. produced an estimated 400,000 tons of talc in 1971, 5.3 percent more than that of 1970. Despite large reserves and the development of new mines and beneficiation facilities, imports of talc increased from 50,800 tons in 1968 to 82,700 tons in 1969 and to 92,200 tons in 1970.

The iron-free talc found in the U.S.S.R. is mined at Onot in Irkutsk Oblast', East Siberia. The annual capacity of this mine is 40,000 tons of talc; the raw materials are shipped to the Miass talc mill in the Urals. Miass and Shabrovsk deposits in the Urals and the Kirgiteysk deposit in Krasnoyarsk Kray were the major Soviet producers of talc in 1971. Some talc ore was also mined from the Southern Osetinsk and other small deposits. At the Miass talc combine, a new crushing mill that will process 200,000 tons of talc ore per year was under construction. During 1971, intensive searches for new deposits of talc were undertaken and brought small results in Transbaykal.

MINERAL FUELS

Production of primary energy derived from fossil fuels, fuelwood, and hydroelectric and nuclear generation rose from 976.6 million tons in standard fuel (coal), equivalent in 1965 to 1,274.3 million tons in 1970, to an estimated 1,328 million tons in 1971. The oil and natural gas share of the energy fuel supply rose from 59.3 percent in 1970 to 60.4 percent in 1971 and that of coal declined from 36.1 percent to 35.3 percent. However, coal was still the major source of fuel consumed. The contributions of fuel peat and oil shale did not change.

Production of fuel, by type rose as follows:

Type of fuel		1965	1970	1971[e]
Coal	million tons	577.7	624.1	640.8
Crude oil[1]	do	242.9	353.0	377.1
Associated and nonassociated natural gas	billion cubic meters	127.7	197.9	212.4
Peat	million tons	44.8	47.5	44.8
Shale	do	21.3	24.3	26.3
Wood	million cubic meters	125.0	105.0	103.0

[e] Estimated.

[1] In accordance with statistical procedures accepted by the Central Statistical Administration, gas condensate is included in crude oil production.

Production of fuel in terms of standard fuel equivalent was as follows:

Type of fuel	1965		1970		1971	
	Million tons	Percent	Million tons	Percent	Million tons	Percent
Coal	412.5	42.7	432.7	35.4	444.2	34.6
Crude oil	346.4	35.8	502.5	41.1	537.3	41.8
Gas (associated and nonassociated)	149.8	15.5	235.5	19.1	250.6	19.5
Peat	17.0	1.7	17.7	1.5	16.7	1.3
Shale	7.4	.8	8.8	.7	9.5	.7
Wood	33.5	3.5	26.6	2.2	26.6	2.1
Total	966.6	100.0	1,221.8	100.0	1,284.9	100.0

In 1971, thermal and nuclear power stations generated 675 billion kilowatt hours, and hydroelectric power stations produced 125 billion kilowatt hours. The relative amount of power generated by hydroelectric stations decreased to 15.6 percent, compared with 16.8 percent in 1970.

Primary energy output has not kept up with the demands of the Soviet economy. According to Soviet sources, at present, the fuel deficit in the European part of the U.S.S.R. reaches about 100 million tons of standard fuel equivalent per year and will grow to between 140 and 150 million tons of standard fuel by 1975. This deficit cannot be avoided because of a continuous growth in energy consumption in this area concomitant with industrial development, a growing fuel export, insufficient production in the Donets Basin, and low efficiency of fuel economy.

Fuels and electric power continued to play a major role in Soviet exports. The relative share of fuels and electric power in the aggregate exports rose during the year from 15.6 percent to 18.0 percent. This growth took place chiefly because of an increase in the sale of crude oil and petroleum products, from 96 million tons to 105 million tons; fuel gas from 3.3 to 4.6 billion cubic meters; and electric power, from 5.3 to 7 billion kilowatt hours.

In 1971 more than one-half of the Soviet exports of crude oil and petroleum products were sent to Communist countries, as was about 70 percent of the fuel gas and 93 percent of the electric power.

On the basis of long-term agreements with Iran and Afghanistan, imports of fuel gas rose from 3.6 billion cubic meters in 1970 to 8.1 billion cubic meters in 1971.

The Soviet Union expects that its petroleum production in 1975 will surpass the current level of the United States. During the 1971–75 period, oil output is expected to increase by 42 percent. The U.S.S.R. plans to make oil and gas together account for 67.4 percent of its fuel production in 1975, compared with 60.4 percent in 1970. Separately, petroleum is slated to account for 44.1 percent of the 1975 fuel output, gas for 23.3 percent, and coal for 29.5 percent, compared with 41 percent for petroleum, 19.4 percent for gas, and 35.9 percent for coal in 1970. About 22,000 kilometers of trunk oil lines are to be put into service during 1971–75. The Soviet Union is allocating three times more capital investment to expand its trunk oil line transport than it did during 1966–70. The Soviet trunk oil line network is slated to exceed 50,000 kilometers by the end of 1975. It is also planned to build more than 30,000 kilometers of trunk gas lines, with the overall length expected to reach 100,000 kilometers by the end of 1975.

The U.S.S.R. plans to increase the percentage of surface coal mining from 26.7 percent in 1970 to 31 percent in 1975.

The eastern regions of the U.S.S.R. are expected to provide more than 75 percent

Table 5.—U.S.S.R.: Structure of extraction and production of primary energy in 1975 compared with 1970

	1970 actual			1975 planned		
		Percent of			Percent of	
	Production	Fuel resources	Fuels-energy resources	Production	Fuel resources	Fuels-energy resources
Crude oil including gas condensate million tons..	353.0	41.1	39.6	505.0	44.1	42.4
Natural gas.......billion cubic meters..	197.9	19.1	18.6	320.0	23.3	22.4
Coal....................million tons..	624.1	35.4	34.6	694.9	29.5	28.4
Fuel peat.....................do....	47.5	1.5	1.4	78.3	1.5	1.4
Shale.........................do....	24.3	.7	.7	32.7	.7	.7
Fuel wood.......million cubic meters..	69.0	2.2	1.4	55.5	.9	.9
Total fuel resources million tons of standard fuel..	1,221.8	100.0	96.3	1,639.0	100.0	96.2
Hydroelectric power billion kilowatt hours................	12.4	--	3.6	165.0	--	3.3
Nuclear power..billion kilowatt hours..	3.5	--	.1	25.0	--	.5
Total fuel-energy resources, million tons of standard fuel...	1,269.1	--	100.0	1,703.5	--	100.0

of the overall increase expected in fuel production during the 1971–75 period. They are expected to supply 37 percent of the oil, 49 percent of the gas, and 49 percent of the coal, compared with 18 percent of the oil, 30 percent of the gas, and 43 percent of the coal that came from these regions in 1970.

The level of Soviet primary energy production in 1970 and planned output for 1975 is shown in table 5.

The output of fuel and energy from all sources in the U.S.S.R. in 1975 is estimated at 1,600 million tons of standard fuel. By 1980, Soviet primary energy production from all sources is to rise to 1,900 million tons. Compared with 1970 output, the 1980 production of gas is to rise by 85 percent, oil by 70 percent, and coal by 15 percent. Clearly, there will be a trend toward greater use of oil; however, it is expected that the U.S.S.R. will make great efforts to substitute coal and natural gas for petroleum in order to make the latter available for export. The Soviet Union, therefore, will still consume considerably less oil per capita than Western European countries. Total consumption of all types of primary energy in the U.S.S.R. is to be equivalent to about 1,650 million tons of standard fuel in 1980. This is about 1.5 times the 1970 consumption.

Coal.—In 1971, 10 major and numerous minor coalfields produced 641 million tons of run-of-mine coal; bituminous, 410 million tons; anthracite, 76 million tons; and lignite, 153 million tons; or an estimated 366 million tons of clean coal, placing it second among the world coal producers. About 28 percent of the total output was surface-mined. The 3.1-percent increase over the 1970 level was achieved mainly in lignite, 153 million tons of which was produced, 3.4 percent more than that of 1970. The coal industry employed about 2.2 million men and women, including 1.2 million production workers and 225,500 university graduate specialists and graduate technicians.

In 1971, there were about 1,000 underground coal mines with an average annual capacity of about 462,000 tons and 68 open pit mines with average annual output of 2.26 million tons of run-of-mine coal in operation. The official average ash content of all marketable coal increased from 19.7 percent in 1970 to 19.9 percent in 1971. The calorific value of coal shipped averaged around 5,000 kilocalories per kilogram (9,300 Btu per pound).

In 1971, 89 underground and open pit mines did not meet production quotas, and 222 underground and open pit mines did not attain the planned capacities.[39]

Production of raw coal is planned to increase to 634 million tons in 1972, 652 million in 1973, 670 million in 1974, and 695 million tons in 1975. Estimated levels of coal output for 1975 and 1980 are 670 million tons of raw (383 million tons of clean) and 720 million tons of run-of-mine (412 million tons of clean), respectively. According to Soviet long-range forecasting, even though oil, natural gas, and nuclear power are developed to a maximum, by the year 2000 the demand for coal will be over 1 billion tons.

Over one-third of all coals mined in the U.S.S.R. is used to generate electric power, and one-fourth is used for coking and in metallurgical production. The demand for fuel coal in the municipal and household sectors, especially in the rural areas, are growing. Deliveries of coal for export are increasing.

Reserves.—Coal reserves, by area and by category, are shown in table 6.

Table 6.—U.S.S.R.: Minable reserves of coal, by areas and categories

(Billion metric tons)

Area	Minable reserves		
	A, B, C_1	C_2	Total
European U.S.S.R	59.1	26.1	85.2
Urals	1.8	.2	2.0
Asian U.S.S.R	200.5	236.0	436.5
Total	261.4	262.3	523.7

Source: Economic Commission for Europe, Coal Committee, VAB/SYMP/COAL/A-10, May 20, 1969, p. 2.

The composition of the U.S.S.R. coals according to rank is approximately as follows: anthracite and lean coals, 11.6 percent; coking coal, 21.8 percent; gas coal, 8.6 percent; long-flame coal, 16 percent; coals changing from brown to hard, 5.1 percent; and brown, 36.9 percent. Thus, two-thirds of reserves consist of hard coal.

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[39] Bezopasnot' truda v promyshlennosti (Labor Safety in Industry), Moscow. No. 8, August 1971, p. 60.

New Capacities.—During the 1966–70 5-year plan, capacities for the mining of 92.4 million tons of raw coal per year and for the preparation of 42.9 million tons per year were put into operation. Renovation of 62 underground and open pit coal mines with a total increase in capacity of 37.8 million tons of raw coal was completed.

Of the 22 underground mines and open pits planned with a total annual capacity of 27.35 million tons, 18 underground and open pit mines with a total capacity of 17.3 million tons of run-of-mine coal were put into operation in 1971. Capital investment for 1971 was 1,833 million rubles, or 93.2 percent of planned total of 1,967 million rubles. At many mines, construction schedules were double the planned building period.[40]

Over 30 percent of all Soviet coal mines did not reach planned indexes. Some of them have been lagging behind their annual targets for many years.[41]

During the 1971–75 period, there are plans to put into operation 26 underground and 16 open pit mines with a total annual capacity of 158 million tons of run-of-mine coal and capacities for preparation of 64.5 million tons per year of raw coal. In comparison with the previous 5-year plan period, the commissioning of capacities is to increase by over 60 percent in the Asian part of the country and by over 40 percent in the western part.

The problem is especially acute in the Donets Basin, which accounts for one-third of all coal mined in the U.S.S.R. and one-half of the coal used for coke. Production of coal in this basin is to increase to 226 million tons of run-of-mine coal by 1975. The presence of a large number of small, unprofitable mines with obsolete equipment, the rapid depletion of mines, and the extremely low rate of renovation and development of new mines considerably complicate the solution of this problem.

In the Kuznetsk Basin, it is proposed to increase extraction of raw coal by 135 million tons per year by 1975. There the development of the promising Yerunakovskiy field of coking coals is to be started. Annual output of coal in the Kazakhstan is to reach 91 million tons of run-of-mine coal by the end of the 5-year period.

Production Centers.—Raw coal production by principal basins in 1971 was as follows, in million metric tons:

Basin	Total output	Coking coal
Donets	217.5	85.4
Kuznetsk	115.5	49.8
Karaganda	39.8	16.9
Moscow	36.7	--
Pechora	21.9	13.2
Others	209.6	3.7
Total	641.0	169.0

Mechanization.—A great number of mines, which had been accepted as fully mechanized and automated, do not conform with the technical level of existing Soviet "Basic Codes and Requirements for Overall Mechanization and Automation," mainly in stopes and development.

Because of poor quality and shortage of spare parts, mechanized complexes KM–81 have been idled for 37 percent of working time; OMKT, 35 percent: KM–87, 23 percent; and KM–97, 13 percent.[42]

Productivity.—In 1971, average monthly (25.4 shifts) official productivity of the Soviet coal miners was 62.3 tons; 48 tons in underground mining and 310 tons in open pit mines. But these data are misleading because they are limited to a restricted group of production workers. Furthermore, the productivity statistics on the Soviet coal industry are based on unprepared run-of-mine coal, whereas it is customary elsewhere to measure output and productivity in terms of marketable coal. If the previously mentioned indexes are taken as reasonably accurate, they contain a more than threefold exaggeration of labor productivity over actual performance. The underground coal mine No. 1, named after Chelyuskintsev, "Donetskugol'" combine in the Donets Basin, with an annual capacity of 1.2 million tons of run-of-mine coal, employed over 3,500 workers in 1971.[43]

Twenty-four scientific research institutes with staffs of 23,000 persons were operating in the Soviet coal industry in 1971.

Preparation.—Preparation of coal for the market did not play a great role in the industry and was normally restricted to coking coals. Because of a shortage of coal, efforts were directed solely to fulfilling quantitative goals and little attention was paid to the quality. About 65 percent of the coal beneficiated was washed, some 15 percent was treated by pneumatic methods, and 20 percent was treated by heavy media, flotation, and other methods. The goal of the 1966–70 5-year plan in coal preparation plant construction was not fulfilled. As a result, average ash content of marketable coal in the Donets Basin increased from 20.3 percent in 1965 to 22.7 percent in 1970.[44] The increase of 1.0 percent in ash content of shipped coal, resulted in 180 million rubles in losses for the Donets Basin.[45]

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[40] Stroitel'naya gazeta (Construction Gazette), Moscow. Dec. 10, 1971, p. 2.

[41] Sovietskiy shakhter (Soviet Miner), Moscow. No. 2, February 1972, p. 2.

[42] Bezopasnost' truda v promyshlennosti (Labor Safety in Industry), Moscow No. 1, January 1972, pp. 61–62.

[43] Sotsialisticheskaya industriya (Socialist Industry), Moscow, March 12, 1972, p. 3.

The throughput of the Soviet Union's 174 preparation plants was 293 million tons of run-of-mine coal (180 million tons of clean coal), which represented about 46 percent of the total coal produced in 1971.

There are plans to commission 15 new preparation plants with a total annual capacity of 55.5 million tons of raw coal during the 1971–75 5-year plan.

Trade.—The relative share of coal and coke in the official aggregate exports rose from 3.2 percent in 1970 to 3.6 percent in 1971. The Soviet policy of increasing exports of high-quality coal, largely from the Donets and Kuznetsk Basins, and coke to non-Communist countries will be continued in the future, but the exports of solid fuels to non-Communist countries is not likely to grow significantly. As in the past, the market for coal and coke from the U.S.S.R. will be limited mainly to East and West Europe and Japan.

The Soviet Union has proposed to supply up to 10 million tons of coal to Japan on the condition that Japan provides it with loans to help develop a large coalfield in the southern region of Yakutia. Discussions on the development of this coalfield have been held for some time by the Joint Japan-Soviet Economic Commission. The Soviet Union plans to build a large coal transshipping complex at Wrangel port, about 100 kilometers from Vladivostok in the Soviet Far East. Construction of this deepwater port has been designed with the aid of Japanese engineers.

Poland was the major exporter of coal and coke to the U.S.S.R. All of the reported imports of Polish coal and coke are in reality reexports on Soviet account to East Germany and other countries.

Natural Gas.—The Soviet Union is among the world's largest producers and consumers of natural gas and a net importer of this commodity. In 1971 the U.S.S.R. produced 212 billion cubic meters of usable gas, 6 percent more than that of 1970. Of this quantity, over 99 percent consisted of natural and associated gas, and about 1 percent came from gasification of coal and oil shale. About 80 percent of the total was produced in the European part of the U.S.S.R., including nearly one-third in the Ukraine. There were about 3,800 gas wells on production in 1971, including 1,561 gas condensate wells.

During the past decade, the recovery of associated gases rose by about three times and reached 24.9 billion cubic meters in 1971. In 1971 the utilization of associated gas was only 61.7 percent. Significant losses of associated gases were encountered in the old oil regions of the Volga-Urals (2.3 billion cubic meters), the North Caucasus (2.2 billion), Turkmenia (2.3 billion), and also in the new oil-producing regions in Western Siberia (more than 1.5 billion cubic meters). It is planned to carry out a number of important measures for increasing the effectiveness of utilization of associated gas from 61.6 percent in 1970 to 80 to 85 percent in 1975. Its extraction in 1975 has been set at 41.5 billion cubic meters, compared with 22 billion cubic meters in 1970.

Planned extraction of natural gas by union-republic in 1971 was as follows, in billion cubic meters:

Republic	Non-associated	Associated
R.S.F.S.R	69.8	17.614
Ukraine	62.2	2.496
Azerbaydzhan	2.9	2.955
Uzbek	33.5	.109
Kirghiz	.4	.004
Tadzhik	.5	.005
Turkmen	15.5	1.856
Kazakhstan	2.6	.127
Belorussia	--	.295
Total	187.4	24.961

Source: Gazovoye delo (Gas Industry), Moscow. No. 4, April 1972, p. 30–37.

In 1971 exploitation of the large Orenburg gas condensate deposit was begun.

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[44] Ugol' Ukrainy (Ukrainian Coal), Kiev. No. 11, November 1971, p. 7.

[45] Sovetskiy shakhter (Soviet Miner), Moscow. No. 2, February 1972, p. 2.

Gross reserves (proved, probable, and possible) of natural gas rose during the year by 2 trillion cubic meters and reached almost 18 trillion cubic meters. More than 10 new gas and gas condensate fields were found. About 5,000 kilometers of transmission gas pipelines were built. Completed were the Orenburg-Zainsk line, and a number of new sections on the Central Asia-Center, Ukhta-Torzhok, Astara-Karadag, and Nadym-Punga lines.

In the 1971–75 5-year plan, the extraction of gas is to increase by 120 billion cubic meters. It is scheduled to reach 229 billion cubic meters in 1972, 250 billion cubic meters in 1973, 280 billion cubic meters in 1974, and 320 billion cubic meters in 1975, or 62 percent higher than that of 1970.

During the 1971–75 period, 40 gas and gas condensate fields are to be placed into production, including the Medvezhye field in Northern Tyunmen Oblast' and Naip in Turkmenia in 1972. In 1975, the gas transport system from the northern regions of Tyumen Oblast' to the Urals and to the Center, with an annual capacity of 38 billion cubic meters, and Central Asia-Center, with a capacity of 65 billion cubic meters, are to be ready for operation.

The Soviets made significant changes in their plans to develop the natural gas resources in the 1971–75 period. Instead of development and exploitation of West Siberian fields, emphasis is to be placed on tapping more accessible and more explored reserves in the European part of the country and in Central Asia. During the current 5-year period, the basic increment in the extraction of natural gas is to come from the fields of Central Asia, 60 billion cubic meters; from fields in the northern part of Tyumen Oblast', 34.7 billion cubic meters; and from fields in Orenburg Oblast', 24.7 billion cubic meters.

By November 7, 1975, 30,000 kilometers of transmission gas pipeline are to be built. The first string of the dual gas pipeline from Medvezhye to Nadym (to be 1,420 millimeters in diameter with a working pressure of 75 kilograms per square centimeter) is to be completed in 1972. During the year, the first section of the Nadym-Punga gas pipeline (1,220 millimeters in diameter with a working pressure of 55 kilograms per square centimeter) is to be put in operation. Construction of the second string is to be finished in 1973.

In 1972, a total of almost 5,500 kilometers of transmission gas pipelines are to be laid: More than 2,000 kilometers on the Central Asia-Center system; more than 70 kilometers of the gas pipeline extending from the northern regions of Tyumen Oblast' to the Urals; the Valday-Pskov-Riga gas line; the multiple gas pipeline from the eastern part of the Ukraine to the Trans-Carpathians, with a total length of 800 kilometers; and Messoyakha-Norilsk No. 2 and others.

In 1973 it is planned to complete construction of the Shebelinka-Poltava-Kiev-Dolina gas pipeline system for the supplying of gas to a number of consumers in the western regions of the country and also to provide gas for export.

The third string of the Central Asia-Center gas pipeline system is to be built of 1,020 and 1,220 millimeter pipe and is to begin in Western Turkmenia. It is to be laid in the direction of Beyneu-Alexsandrovgay-Ostrogozhsk and is to be completed in 1974. The fourth string of this system is to be completed in 1975. The total annual capacity of the Central Asia-Center gas pipeline system is to be 65 billion cubic meters by 1975.

In 1975 the Nadym-Punga-Nizhnyaya Tura gas pipeline is to be completed in full; its diameter is to be 1,420 millimeters. However, the completion of loopings is to begin in 1973. Gas pipeline on the Nizhnyaya Tura-Perm-Kazan-Gorkiy-Center portion, 1,020 to 1,220 millimeters in diameter, is to be placed into operation in 1973–75. On the portion to Ukhta, the pipeline is to be built of 1,420-millimeter pipe, and beyond the diameter is to be 1,220 millimeters.

The basic increment in the extraction of gas in the country is scheduled to come from large gas and gas condensate deposits and extraction of gas from these fields in 1975 is planned as follows, in billion cubic meters:

Field	Maximum
Medvezhye	35
Shaltyk	32
Orenburg	25
Naip	25
Vuktyl	15
Total	132

The extraction of gas according to the major economic regions is to be as follows, in billion cubic meters:

	1970 actual		1975 planned	
	Quantity	Percent	Quantity	Percent
U.S.S.R.	198.0	100.0	320.0	100.0
European U.S.S.R. and Urals	139.0	70.2	164.1	51.3
Orenburg Oblast'	1.3	.7	26.0	8.1
Komi A.S.S.R.	6.9	3.5	16.1	5.0
East of the Urals	59.0	29.8	155.9	48.7
Western Siberia	9.3	4.7	44.0	13.8
Turkmen	13.1	6.6	65.1	20.3

Exploration and Reserves.—In 1971 ten gas, two oil and gas, and three gas condensate fields were discovered, including the Layavozhskoye, Tarkosalinskoye, and Bovanenkobskoye fields. In the European part of the country, eight gas, three gas and oil, and two gas condensate fields were discovered. The largest discoveries, as in preceding years, were made in the northern part of the West Siberian Lowland—in the Middle Ob and Pur-Tazov oil and gas-bearing areas.

In recent years, the results of geological exploration in the European part of the country, where much of the gas consumption takes place, have significantly declined. The overwhelming portion of the possible gas resources in the European part of the country are concentrated at great depths.

At yearend 1971, gross natural gas reserves in categories proved, probable, and possible reached 15,796 billion cubic meters. About three-fourths of the gross reserves of gas in the U.S.S.R. are found in Western Siberia and Central Asia. At the same time, the major consumers of gas are situated in the European part of the Soviet Union. This calls for the need to build major transmission gas pipelines 2,500 to 3,500 kilometers in length.

The distribution of gross Soviet gas reserves as of January 1, 1971, appears in the following table:

	Gas reserves in categories A, B, and C_1 (billion cubic meters)	Percent national total
European part	3,358.1	21.3
Western Siberia	9,632.9	61.1
Central Asia and Kazakhstan	2,424.7	15.4
Eastern Siberia and the Far East	346.3	2.2
Total	15,762.0	100.0

Gasfields.—The Ukraine occupied first place in the production of gas in the U.S.S.R. and produced over 64 billion cubic meters of gas, or nearly one-third of the national total in 1971. Thirty-four gasfields were in operation, including Shebelinka and Efremovka. A significant place in the total extraction of gas in the Ukraine belongs to the Precarpathians—the oldest oil and gas region in Europe. The Ukraine supplied gas to the Russian union republic, Belorussia, Moldavia, Lithuania, Poland, Czechoslovakia, and Austria. The extraction of gas in this republic is planned at 62 billion cubic meters in 1975.

Uzbekistan, with an output of over 33 billion cubic meters, was the second largest gas producing region. Over 70 percent of the gas was transported to the Urals and to consumers located along the route. Annual extraction of gas is to reach 34 billion cubic meters in 1975.

Turkmenia produced 16.9 billion cubic meters of gas in 1971. The extraction of gas in this republic is to increase by five times during the 5-year plan, from 13 billion cubic meters in 1970 to 65 billion cubic meters in 1975. Thus, Turkmenia will hold second place in the U.S.S.R. in terms of gas production by 1975. It is planned to develop the Shatlyk and Naip fields in this republic. The increment in gas extraction in 1975, based on these fields, is to reach to more than 40 billion cubic meters.

Annual extraction of usable gas in Tyumen Oblast' was over 9 billion cubic meters in 1970 and 1971. By 1975, Siberian gas production is to reach 43 to 44 billion cubic meters. During the first quarter of 1972, it is planned to place into production the first section of the Medvezhye (one of the largest in the U.S.S.R.) gasfield (a gas collection point and 12 wells). This first section is to produce 4.5 billion cubic meters of gas in 1972.

The Orenburg gas condensate field is one of the largest development project of the ninth 5-year plan. It includes three interlinked industrial projects: the extractive sector, the gas refinery plant, and the main pipelines. The extractive sector will consist of six group-points, each with a capacity for extracting 5 billion cubic meters per year. The first group-point was put into operation in September. A gas pipeline, from Orenburg to Zainsk power station (500 kilometers long) was completed in December. It is planned to extract 4.5 billion cubic meters of gas in 1972, 18.5 billion in 1974, and 25 billion cubic meters in 1975. This is about one-fourth of the total national increment in gas extraction during the ninth 5-year plan. About 4 billion rubles in capital investments are being allocated to carry out this program.

There were 32 wells, with an aggregate daily yield of 35 million cubic meters in operation at the large Vuktyl gas condensate field in Komi A.S.S.R. in 1971. Since the beginning of 1969, this field has been in the pilot-commercial stage of exploitation. As of January 1, 1971, 8.5 billion cubic meters of gas had been produced at the field, and production of gas in 1971 reached 10 billion cubic meters. It is planned to produce 15 billion cubic meters at this field in 1975. Possible complications and sharp reductions in well head pressure make it necessary to plan for comparatively small optimal gas extractions from this field during 1971–75.

Production of gas in Azerbaydzhan and Kazakhstan is planned as follows, in billion cubic meters:

	1971	1972	1973	1974	1975
Azerbaydzhan	5.2	6.0	6.0	6.0	6.0
Kazakhstan	2.7	4.3	5.2	6.2	7.0

Other significant gas producers in 1971 were Volgograd, Saratov, and Kuybyshev Oblast's, Bashkir and Tatar A.S.S.R., and Sakhalin Island.

Transportation.—Over 80 percent of 1971 natural gas production was carried by trunk pipeline, and only 20 percent was consumed at or near the place of production. The total length of gas trunk pipelines was around 70,000 kilometers at yearend 1971. Approximately 4,857 kilometers of gas trunk pipelines were planned for completion during the year, including 680 kilometers on Central Asia-Center No. 2, the 508-kilometer Orenburg-Zainsk, and a considerable amount on the Ukhta-Torzhok No. 2 gas pipeline.

The total length of gas pipelines, which are to be laid during 1971–75, is to reach 30,000 kilometers, and this means that by the end of 1975 there are to be 100,000 kilometers of gas lines available. In the ninth 5-year plan, the volume of capital investment in the construction of gas pipelines is to reach 6.2 billion miles.

Distribution of transmission gas pipelines, by pipe diameter, beginning of 1971 year, was as follows:

Diameter (millimeters)	1971 (kilometers)
Up to 273	8,330
325–529	21,394
630–820	18,040
Above 1,000	19,755
Total	67,519

Underground Gas Storage.—On January 1, 1971, the total volume of underground storage facilities was 14 billion cubic meters, 5.5 billion cubic meters of which were under exploitation. Three underground gas storage facilities, near the cities of Otrandnyy in Kuybyshev Oblast', L'vov, and Novgorod, were under construction in 1971.

Development of underground storage facilities lagged behind goals foreseen in the 1966–70 5-year plan; however, construction of new facilities continued to grow as follows:

Indicator	1965	1966	1967	1968	1969	1970	1971
Injection of gas billion cubic meters	1.8	2.2	3.2	3.8	4.1	5.5	5.5
Annual withdrawal do	1.0	1.4	1.8	2.7	3.4	3.6	3.7
Number of facilities	10.0	10.0	11.0	13.0	15.0	15.0	15.0

Consumption.—A preliminary report of Soviet consumption of natural gas in 1971 is presented in the following tabulation:

Consumer	Billion cubic meters	Percent of total
Communal everyday needs	27.2	12.8
Generation of electric power	55.6	26.2
Industry:		
Chemical	13.8	6.5
Metallurgy	33.0	15.4
Machine-building and metal working	21.1	9.9
Construction materials	20.0	9.4
Oil and gas	19.6	9.2
Light	2.7	1.3
Food	7.0	3.3
Woodworking	1.5	.7
Other	3.0	1.4
Total industry	121.7	57.2
Transport	.7	.3
Agriculture	.8	.4
Construction	1.4	.7
Other consumers and losses	5.0	2.4
Total gas consumption	212.4	100.0

Natural gas became of considerable significance in metallurgy, whose share in the total Soviet gas consumption in 1971 rose to 15.4 percent, compared with 7.5 percent in 1959. Natural gas also went as feedstock in the production of synthetic products and nitrogen fertilizers.

Trade.—In 1971, the Soviet Union was a net importer of gas to the extent of 3.5 billion cubic meters, as exports to Poland, Czechoslovakia, and Austria were exceeded by imports from Iran and Afghanistan. It will remain a net importer from non-Communist areas through 1974. Exports of natural gas (by the "Druzhba" pipeline from the Dashava fields in West Ukraine and by the Efremovka-Czechoslovakia pipeline from the Efremovka field in East Ukraine) totaled 4.6 billion cubic meters in 1971, a 39.4-percent increase compared with those of 1970. Of the 1971 total about 70 percent were exported to Communist countries and over 30 percent to Austria. Soviet imports of natural gas from Iran and Afghanistan increased from 3.6 billion cubic meters in 1970 to 8.1 billion cubic meters in 1971. Delivery of Soviet gas to the West European counties will continue according to long-term contracts.

The Soviet Union is going to emerge as Western Europe's leading supplier of natural gas, all by long-distance pipeline. In 1971, Austria was the only recipient country, but deliveries to Italy and West Germany will begin in 1973 and to Finland in 1974.

Agreement on the delivery to France of 2.5 billion cubic meters of Soviet natural gas every year for 20 years starting in 1976 was signed in July. The all-union association Tekhmashimport and the French firm Cosei have signed a contract for the delivery of three sulfur-removal units to the U.S.S.R. for installation at the Orenburg gasfield during 1973–74. The annual capacity of the equipment will be 15 billion cubic meters of purified gas and 550 thousand tons of marketable sulfur.

A 59-million-ruble contract, signed between the all-union association Mashinoimport and the French firm Cameron-France, calls for the delivery of ball cranes for gas pipelines 1,400 millimeters in diameter to the U.S.S.R. during 1972–75.

In Moscow on April 20, 1971, a contract concerning the delivery of Soviet natural gas to Finland and of Finnish large-diameter steel pipe to the U.S.S.R. was signed. The contract foresees the delivery of natural gas by pipeline for a period of 20 years; the period of delivery of gas will be automatically extended by 5 years, if one of the parties does not indicate his desire to stop deliveries. The delivery of gas must begin on January 1, 1974. In the first year it is planned to supply 0.5 billion cubic meters, and in the next year 1 billion cubic meters. In the subsequent years the volume of delivery will increase by 0.1 billion cubic meters per year and will reach 1.4 billion cubic meters by 1979. In the contract it is stated that buyer and seller will strive to raise the volume of gas deliveries to 3 billion cubic meters per year.

The Soviet Minister of Gas Industry signed a 5-year agreement with Italian National Hydrocarbon Agency (ENI) December 16 in Rome for technical and scientific callaboration between the two countries in natural gasfield. The agreement provides for the carrying out of a number of joint projects, such as the study of certain problems involved in the drilling for natural gas, the construction of large-diameter gas pipelines, including the design of a line from Siberia to Trieste, and the design and construction of installation for processing natural gas.

The United States, Japan, and Sweden are currently negotiating with the U.S.S.R.

for the supply of Soviet gas; Denmark and Norway are as yet only potential markets for Soviet gas.

It is probable that an agreement will be reached based on Austria's wish for additional deliveries of between 2 and 4 billion cubic meters of Soviet natural gas. It is also very probable that West Germany and the U.S.S.R. will sign a second long-term agreement for German large-diameter pipelines in exchange for Soviet natural gas. The Soviet Union will probably be supplying West Germany with 7 billion cubic meters by the end of the 1970's.

During the current 5-year plan, there is to be a notable increase in natural gas extraction in all of the COMECON countries, except Bulgaria and Czechoslovakia. Because the demand for gas in Hungary, East Germany, Bulgaria, and Czechoslovakia will grow faster than production, a significant share of these demands will be satisfied through the delivery of gas from the Soviet Union. Poland and Czechoslovakia already receive Soviet gas, and, beginning in 1974, gas will also be imported from the Soviet Union by Hungary, Bulgaria, and East Germany.

Soviet exports will be offset, to some extent, by the imports of gas from Iran and Afghanistan. Soviet natural gas imports from Afghanistan are expected to increase from about 2.5 billion cubic meters in 1971 to 4 billion cubic meters in 1975 and to 4.5 billion cubic meters in 1980. The Soviet press indicates that construction of the second gas pipeline from Iran to the Soviet Union will be started in 1972–73 and completed by 1975. Imports of gas from Iran may be increased from about 5.6 billion cubic meters in 1971 to 10 billion cubic meters by 1975 and to 15 billion by 1980.

Estimated Soviet exports of natural gas are presented in the following tabulation, in billion cubic meters:

	1970	1971	1972	1973	1974	1975	1980
Exports:							
To non-Communist countries:							
Austria	1.0	1.5	1.5	1.5	1.5	1.5	4.5
West Germany	--	--	--	.5	1.0	2.0	7.0
Italy	--	--	--	1.2	3.0	6.0	6.0
Finland	--	--	--	--	.5	1.0	1.5
France	--	--	--	--	--	--	2.5
Total	1.0	1.5	1.5	3.2	6.0	10.5	21.5
To other Communist countries:							
Czechoslovakia	1.3	1.9	2.3	2.7	3.1	3.5	4.5
Poland	1.0	1.2	1.4	1.6	1.8	2.0	3.0
East Germany	--	--	--	--	(1)	1.0	2.0
Hungary	--	--	--	--	(1)	1.0	2.0
Bulgaria	--	--	--	--	(1)	1.0	2.0
Yugoslavia	--	--	--	--	--	.5	1.0
Total	2.3	3.1	3.7	4.3	4.9	9.0	14.5
Total exports	3.3	4.6	5.2	7.5	10.9	19.5	36.0
Imports:							
Afghanistan	2.5	2.5	2.5	2.5	3.0	4.0	4.5
Iran	1.1	5.6	6.0	8.0	9.0	10.0	15.0
Total imports	3.6	8.1	8.5	10.5	12.0	14.0	19.5

[1] Less than ½ unit.

Petroleum.—Crude oil and gas condensate output in 1971 increased by 19.4 million tons, or 5.5 percent, to a total of 377 million tons. It was a poor year for the Soviet petroleum industry. Over 28 percent of the total (105 million tons) was exported either as crude or as refinery products. More than one-half of the total exports were sent to other Communist countries.

In 1971, 473 oil and gas condensate fields were in production, with a total of more than 55,000 wells. Oil was produced in a number of separated regions, of which the European U.S.S.R. was the most important. The Volga-Urals area produced more than 56 percent of the 1971 total. Production of Asiatic oilfields in West Siberia, Kazakhstan, Central Asia, and Sakhalin Island accounted for 21.7 percent; the development of eastern oilfields was increasing, particularly in Western Siberia and Kazakhstan.

All three primary methods of crude oil production (flowing, pumping, and gas lifting) were used, and secondary recovery methods (repressuring and water flooding) were employed at many older fields in the Soviet Union. Primary and secondary recovery of crude oil in place was reported at 30 to 40 percent.

According to Soviet sources, the cost of production of crude oil (in terms of units of standard fuel) is 4 times cheaper—and that of gas about 9 times cheaper—than the cost of extraction of coal.

Production of crude oil is slated to rise to 395 million tons in 1972, 429 million in 1973, 461 million in 1974, and 496 million tons in 1975. The plan calls for the development of about 300 million tons of new capacity during the 1971–75 period, one-half of which is to cover the decline in production of crude oil at the old fields and one-half (147 million tons) is to be available for a net growth in production. The average annual growth in crude oil extraction is to be increased to 30 million tons during the ninth 5-year plan. More than 75 million meters of exploratory and developmental wells are to be drilled.

The central task of the oil extracting industry during 1971–75 is maintaining the same level of output of crude oil in the Volga-Urals area and bringing about the great increment in oil extraction in Western Siberia, Kazakhstan, Komi A.S.S.R., Turkmenia, and in certain other regions.

The basic increment in crude oil output is to be secured from the fields in Western Siberia and on the Mangyshlak Peninsula. These two regions are to provide 75 percent of the national increment in crude production during 1971–75. In the development of the oil extracting industry during 1971–75, capital investment are to be increased by 28.1 percent.

The influence of the developing large oil producing regions of Western Siberia, Kazakhstan, Turkmenia, Komi A.S.S.R., and other regions calls for the construction of trunk crude oil pipelines. During 1971–75, it will be necessary to complete for operation 22,000 kilometers of crude and product pipelines, or 80 percent of that entire length built in the years before 1971. In the expansion of the pipeline, transport of crude oil during the ninth 5-year plan, 3.9 billion rubles in capital investment will be made, or three times more than during the preceding 5-year period.

The network of crude oil and petroleum product lines is to be increased by more than 5,100 kilometers in 1972. It is planned to complete construction of the following crude oil pipelines during 1972: The 1,135-kilometer Ukhta-Yaroslavl, the 817-kilometer Aleksandrovskoye—Anzhero-Sudzhensk, and the 567-kilometer Ust-Balyk—Kurgan-Ufa—Almetyevsk.

The refining of crude oil is to increase during the 5 years by 1.4 times. The average annual unit capacity for primary distillation is to be enlarged during 1971–75 to 5.2 million tons, compared with 3.2 million tons during 1966–70; average catalytic reforming units are to reach 566,000 tons, compared with 384,000 tons; and hydrotreating units to 1,846,000 tons as against 1,120,000 tons.

One of the basic measures of the plan is the construction and completion of combined, enlarged units for the primary refining of 6 million tons per year instead of the 2 to 3 million tons per year as originally planned, catalytic reforming units with a capacity of 600,000 to 1 million tons against 300,000 tons, hydrotreating units up to 2.6 million tons instead of 1.2 million tons, and coking units of 1.5 million tons capacity per year against 0.6 million tons, as originally planned.

The volume of capital investments in the oil refining industry has been established in the plan at a growth of 62.1 percent compared with that of 1966–70. More than 70 percent of these investments are to be directed to the expansion and renovation of existing enterprises. It is planned to build nine new oil refineries. Priority will be given to the construction of new oil refineries in the eastern regions, where the Achinsk, Pavlodar, and Chimkent refineries will be erected, as well as the Tobolsk and Tomsk petrochemical complexes and the Far East oil refinery plant.

During the ninth 5-year plan, the extraction of crude oil, gas, gas condensate, and the manufacture of petroleum products are to be increased as follows:

		1970	1975
Crude oil	million tons	348.8	496.0
Gas condensate	do	3.8	9.0
Natural gas	billion cubic meters	198.0	320.0
Liquefied gas	million tons	4.8	9.0
Primary distillation of crude oil	percent	100.0	140.1
Automobile gasoline	do	100.0	136.4
Diesel fuel	do	100.0	125.4
Furnace mazut	do	100.0	139.0

Shifts in the production of crude oil can be seen from the following tabulation:

	1970 actual		1975 planned	
	Million tons	Percent of grand total	Million tons	Percent of grand total
European part of U.S.S.R. and the Urals:				
Tatar A.S.S.R	101.9	29.2	101.0	20.4
Bashkir A.S.S.R	39.2	11.2	40.0	8.1
Kuybyshev Oblast'	35.0	10.0	35.0	7.1
Orenburg Oblast'	7.4	2.1	14.0	2.8
Perm Oblast'	16.1	4.6	21.5	4.3
Komi A.S.S.R	5.6	1.6	10.0	2.0
Total	285.2	81.8	314.5	63.4
Region east of the Urals:				
Western Siberia	31.4	9.0	125.0	25.2
Turkmenistan	14.4	4.1	22.0	4.4
Kazakhstan	13.1	3.8	30.0	6.0
Total	63.6	18.2	181.5	36.6
Grand total	348.8	100.0	496.0	100.0

Exploration and Reserves.—In 1971, more than 10 million meters of exploratory and developmental wells were drilled; however, drilling plans were not fulfilled in several regions. There was a need to assure the search for oil so as to provide an increase in existing reserves in such old regions as the North Caucasus, Azerbaydzhan, the Ukraine, Kazakhstan, and Turkmenistan. Drilling in these regions was basically associated with the drilling of wells over 4,000 meters deep. The annual capital investments in Soviet exploratory drilling reached more than 1 billion rubles. About one-third of all of the prospecting and exploratory wells were transferred to the oil producers for use as developmental wells, for use as injection wells and for other purposes.

In 1971, about 10 percent of the total number of drilling rigs in the country were concentrated in Western Siberia. In this region during 1971–75, it is planned to drill 7.0 to 7.5 million meters of developmental wells. There were no special drilling rigs constructed for operation under the conditions present in Western Siberia, and also the need for rapid development of the oil extracting industry, placed higher requirements on the drilling rigs being used in this region.

All of the drilling rigs, in terms of ease of transportation and ease in erection, were not sufficiently adapted for operation in the severe natural climatic conditions of Western Siberia. This was the major factor depressing the rates of well construction. The average amount of time to move drilling equipment 1 kilometer in its shifting from one drilling site to another was almost 5 times greater than in Bashkiria, and the cost was 4.5 times higher. Up to 1972, the problem of transporting drilling equipment remained unresolved.[46] The Soviet Union also lacked good drill bits principally because of many unsolved problems of their hard-alloy metallurgy. An experimental rig, jointly developed by France and the U.S.S.R., was put into service in 1971.

As of January 1, 1971, the proved, probable, and possible reserves of crude oil in place in the U.S.S.R. were estimated at over 30 billion tons. The quota for increasing the recoverable oil reserves was not fulfilled in the preceeding 5-year plan. Thus, for the three categories A (proved in place), plus B (probable in place), plus C_1 (possible in place), the fulfillment of the increase in reserves was 89.1 percent, and, for the two categories A plus B, it was 83.8 percent. This was explained by the insufficient effectiveness of geological explorations.[47]

For working out future Soviet plans covering the development of the oil and gas industry and prospecting and drilling operations, a reserves in place/production ratio is used. The recommended ratio is 20 to 25 times for crude oil reserves in place in categories A plus B plus C_1. For gas, the reserves in place/production ration for reserves in categories A plus B plus C_1 is 25 to 30.[48] This indicates that the recoverable reserves/production ratio must be variable in each of the regions.

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[46] Ekonomika neftyanoy promyshlennosti (Economics of Petroleum Industry), Moscow. No. 2, February 1972, pp. 13–15.

[47] Neftyanik (Oil Worker), Moscow. No. 2, February 1972, pp. 1–3.

Oilfields and Crude Oil Production.—In 1971, the Volga-Ural area contributed over 56 percent of the national output; this area will continue to lead until the developing oilfields of Siberia, Mangyshlak, and the Ukraine come into their own. The Tatar A.S.S.R. remained the Soviet Union's leading crude producer, but output increased only by around 1 percent in 1971. A similar small gain in 1972 is expected to raise Tataria's crude output to 102 million tons, and, by 1975, Western Siberia will replace Tatar A.S.S.R. as the Soviet Union's leading crude producer. Bashkir A.S.S.R., in the Volga-Ural area, produced around 40 million tons of crude in 1971.

Western Siberia accounted for most of the U.S.S.R.'s oil production gain in 1971. This area's output increased from 31 million tons in 1970 to 44 million tons in 1971, accounting for two-thirds of the Soviet Union's crude extraction growth.

Other important regions of Soviet crude expansion in 1971 included the Mangyshlak Peninsula in Kazakhstan, Udmurt A.S.S.R., and Perm Oblast' in the Volga-Urals area. For the past few years the extraction of crude oil in Azerbaydzhan, the oldest oil-producing region in the U.S.S.R., has been declining. In 1971, this republic produced 19.2 million tons of crude, or 1 million tons below the 1970 level.

Actual output of crude oil by principal region for 1971 and planned for 1975 appears in the following tabulation:

Region	Percent of total	
	1971	1975
Volga-Urals	56.3	43.5
Komi A.S.S.R.	1.6	2.9
Belorussia	1.5	2.0
Ukraine	3.7	3.0
North Caucasus and Transcaucasus (including the Groznyy, Dagestan, Krasnodar, and Stavropol Oil Associations and Azerbaydzhan)	15.2	12.4
Western Siberia	11.9	25.3
Central Asia and Kazakhstan (including the Uzbek, Turkmen, Kirghiz, Tadzhik, and Kazakhstan Oil Associations)	9.2	10.4
Soviet Far East	.6	.5
Total	100.0	100.0

Thus, in 1975, the relative share of the Volga-Urals will be significantly reduced, with a concomitant growth in the relative share of Western Siberia, Kazakhstan (Mangyshlak Peninsula), Komi A.S.S.R., and Belorussia.

In the major Volga-Urals oil regions during 1971–75, for the maintaining of present production levels, it is planned to place into production new deposits where reserves are small. The level of crude production in Bashkir A.S.S.R. and Kuybyshev Oblast' in 1975 is to be maintained close to the 1970 level by the same means.

The bulk of the increment in crude oil output in Western Siberia is to come from such high-yield fields as Samotlor, Mamontov Agan, Varyegan, and others, and also through the intensive working of the Pravdinsk, Western Surgut, and Ust-Balyk fields, the Shaim group (all preceding are in Tyumen Oblast'), and the Sovetsko-Sosninsk field in Tomsk Oblast'.

Offshore Production.—Several offshore fields have been developed in the Caspian Sea off Azerbaydzhan. The "Neftyanye Kamni" (Oil Stones) field is 20 to 25 kilometers from the coast and the largest in Azerbaydzhan. In 1971, about two-thirds of the crude oil and three-fourths of the natural gas produced in the republic came from offshore fields.

For more than 20 years Neftyanye Kamni fields have been exploited. From the steel trestles, which cover a distance of more than 200 kilometers, more than 1,000 wells have been drilled. These wells produced one-third of the total crude production in Azerbaydzhan in 1971. Drilling platforms were installed at water depth of 10 to 22 meters, and construction of platforms for wells at depths of 25 to 30 meters began in the northeast region of Neftyanye Kamni.

During 1971–75, almost 780,000 meters are to be drilled offshore in Azerbaydzan. The depth of wells are constantly rising and by the end of the ninth 5-year plan the depth is to exceed 5,000 meters. According to Soviet calculations, 60 to 65 percent of the predicted reserves of oil and gas in Azerbaydzhan are to be found offshore. However, to find these reserves, the U.S.S.R. lacks the proper techniques.

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[48] Geologiya nefti i gaza (Geology of Oil and Gas), Moscow. No. 1, January 1972, pp. 27–33.

In 1967, the floating platform "Apsheron" began drilling its first deep (1,800 meters) well near Savenko Bank. Water depth in this region of the Caspian Sea reaches 13 to 14 meters. A floating rig, the "Khazar", built in the Netherlands to Soviet specifications, was put into operation in 1968. It is capable of drilling in the Caspian Sea where water depth is not more than 60 meters. The equipment was built for drilling to a depth of 6,000 to 7,000 meters. The floating drilling platform, the "Azerbaydzhan", construction of which started in 1968, was completed in December. This largest Soviet floating rig can drill wells to a depth of 3,000 meters in water up to 20 meters deep. The Uralmash plant in Sverdlovsk has designed a floating rig that can drill up to 6,000 meters (presumably a copy of Khazar).

Drilling of three offshore wells near Zhdanov Bank at Chelekan and construction of Turkmenia's first 25-kilometer underwater oil pipeline were nearing completion at yearend. The exploitation of the Banka Zhdanov oil and gasfield will begin in 1972, and output of 300,000 tons of crude oil is expected in that year. Three test wells were also being drilled in another location in the Caspian Sea, at Banka Zhdanov, offshore from Turkmenia.

The Ukraine's first offshore well was being drilled in the Black Sea, near Golitsino, where the depth of the water reaches 35 meters. The drilling of the well, to a depth of 3,000 meters, was carried out from an artificial steel island. Construction of an offshore drilling platform is to start south of Okha, Sakhalin Island, in 1972. It will be 2 to 3 kilometers out to sea in about 15 meters of water. Drilling for gas in the Arctic coastal area is to begin also in 1972, mainly in offshore areas of the Pechora Bay.

Refining and Petroleum Products Supply.—The 1971 plan evisaged an increase of 5.8 percent over 1970 crude oil primary processing. However, the planned goal was not met. In 1971, estimated crude oil primary processing was 5 percent, and oil refinery production was 4.5 percent higher than that of 1970. Approximately 80 refineries were in operation, with a total estimated capacity of 303 million tons. Soviet output of refined products from crude oil (including refined petroleum from natural gas-natural gas liquids) in 1971 has been estimated at 253 million metric tons.

In 1971, there was an excess of 66-octane gasoline and a shortage of 72-octane and 76-octane gasoline. There were also problems encountered in the adequate supplying of certain types of lube oil, greases, and other specialty products. In 1972, despite an increase in the production of lube oils and greases, the demand for certain of these products will not be fully satisfied.[49]

In 1971 new capacities for the primary distillation of crude oil were completed at the Kherson and at Kirishi oil refineries. Exploitation was begun on new large catalytic reforming and hydrotreating units at the Novo-Ishimbay refinery. Facilities for the hydrotreating of diesel fuels began operating in the Perm, Kremenchug, and Kirishi refineries.

The 5-year plan envisages the following for the oil refining industry during 1971–75:

1. Increase product output in 1975 by 1.4 times as compared with 1970;
2. Significantly reduce the time required for the designing and construction of oil refineries and the time required for reaching design capacity;
3. Improve product quality;
4. Provide for the output of chiefly low-sulfur diesel fuel, high-octane gasolines, lubricating oils with highly effective, multipurpose additives, and widely use means for the optimum removal of sulfur from oil products; and
5. Expand the output of aromatic hydrocarbons, low-sulfur electrode coke, liquefied gases, and petroleum raw materials for the chemical industry.

In the area of construction of new oil-refining enterprises, the 5-year plan calls for:

1. In the R.S.F.S.R., begin construction of an oil refinery in Arkhangel Oblast', begin construction of a large petrochemical complex in Tobolsk, speed up construction of the Achinsk oil refinery, complete the expansion

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[49] Neftyanik (Oil Worker), Moscow. No. 5, May 1972, p. 7.

of the Komsomolsk oil refinery, and begin construction of a new refinery in the Soviet Far East;
2. In the Ukraine, complete additional capacities at the Kremechug refinery, complete the construction of the Lisichansk refinery, and begin building two new oil refineries;
3. In Belorussia, construct and place into operation the Mozyr oil refinery;
4. In Kazakhstan, build the first sections of crude oil refineries in northern and southern Kazakhstan;
5. In Turkmenia, complete the first section of the Chardzhou oil refinery;
6. In Lithuania, complete the first section of an oil refinery; and
7. In Azerbaydzhan, reorganization of the oil refining industry, which has fallen behind modern standards. Only two refineries will remain, Vladimir Ilyich refinery and the 22d CPSU Congress refinery. The former is to be renovated and its annual capacity raised to 18 million tons; the capacity of the latter will remain at its present level.

The sulfur content in the crude oil being produced will change for the better. The growth in crude output in Western Siberia, Kazakhstan, the Ukraine, Turkmenia, Belorussia, and the Checheno-Ingush A.S.S.R. has brought about a reduction in the relative share of high-sulfur crudes in the latter years of the past 5-year period. This tendency will be preserved during the current 5-year period.

In 1972 the refining of crude oil is to increase by about 7 percent, the output of high-octane gasoline is to rise by 19 percent, diesel fuel by 7 percent, and furnace mazut by 7.4 percent compared with those levels for 1971. In 1972 the Main Administration for Oil Supply (Glavneftesnab) of the R.S.F.S.R. is to deliver to consumers 232 million tons of oil products, or 6.8 percent more than in 1971.

Transportation.—About two-thirds of the total tonnage of crude oil and refinery products moved in the U.S.S.R. in 1971 was shipped by rail. The total length of trunk crude and product lines, as of January 1, 1971, totaled over 30,000 kilometers, and average distance of pipeline deliveries in 1971 was 800 kilometers. Only about 70 percent of total pipeline capacity was utilized. There are plans to complete 22,000 kilometers of oil pipelines in the 1971–75 period.

In 1971, the following crude oil pipelines were completed: Kremenchug-Kherson, 355 kilometers; Gorkiy-Ryazan No. 2; the first section 248 kilometers of the total 818 kilometers of the Alekshandrovskoye—Tomsk—Anzhero-Sudzhensk; and some sections of the Friendship No. 2. These product pipelines were also completed: Kirishi-Leningrad, 114 kilometers; Polotsk-Venspils; and Ryazan-Moscow.

The U.S.S.R. is building two major oil pipelines, the largest in the country, to transport Western Siberian oil to the West and to the East. Approximately 5,500 kilometers of new trunk crude oil pipelines are to be laid by 1976, through which Siberian crude will flow to the Pacific Ocean. The construction of this pipeline would make possible large-scale exports to Japan, which were the subject of discusssion as long ago as 1965. This pipeline, Tyumen-Nakhodka, will be laid in stages. Construction of the first stage of this line, the Anzhero-Sudzhensk—Krasnoyarsk—Irkutsk No. 2 (1,450 kilometers), began in 1971 and is scheduled for completion in 1973. The Anzhero-Sudzhensk—Irkutsk pipeline is an extension of the 818-kilometer, 1,220 millimeter-diameter Aleksandrovskoye—Tomsk—Anzhero-Sudzhensk crude oil pipeline, which was under construction in 1971, scheduled for completion by the end of the first quarter of 1972.

Construction of the 1,836-kilometer, 1,220-millimeter-diameter Ust'-Balyk—Kurgan—Almetyevsk crude oil pipeline began in 1971, through which Siberian crude oil will find an outlet to the European part of the country. From Almetyevsk, the oil may be moved to Gorkiy, Perm, Kirishi, Yaroslavl, and to the Friendship crude oil pipeline. The line is to be placed into operation during the first 6 months of 1973.

In 1971, pipe welding began on the Michurinsk-Kremenchug crude oil pipeline. It is to be put into operation in 1973 and then continued to Kherson and Odessa. Construction was in progress on the 1,400-kilometer Kuybyshev—Tikhoretsk—Novorossiysk crude oil pipeline. It will carry oil from the Volga-Urals, Western Siberia, and Mangyshlak. The first section is to go into operation in 1972, and the entire line is to be completed by the end of 1975.

Planning has begun on the 1,300-kilometer Nizhnevartoskoye—Kurgan—Kuybyshev crude oil pipeline. This pipeline will take crude oil from the Samotlor field and near Kuybyshev will deliver the crude to the existing pipeline. Construction of the pipeline is to be completed by 1976. The route of the 2,000-kilometer Omsk—Pavlodar—Chimkent crude oil pipeline has been selected. This line will pass through Karaganda, Temirtau, Dzhezkazgan, and 465 kilometers through Chimkent Oblast'.

In 1971, the Soviet Union contracted with I. H. C. Holland and its subsidiary, R. J. Brown and Associates, for a large pipelaying barge and pipe-coating plant. Delivery is scheduled for 1973. The vessel will lay three pipelines across the bottom of the Caspian Sea at depths up to 215 meters, each 250 kilometers long and varying in diameter from 220 millimeters to 880 millimeters.

Trade.—Soviet exports of crude oil and petroleum products totaled 105.1 million tons in 1971, a 10-percent increase over the 1970 level, comprised of nearly 75 million tons of crude oil and over 30 million tons of products. Of the 1971 total, 49.6 million tons of crude oil and products were shipped to non-Communist countries and the rest went to other Communist countries. As usual, most of the exports were absorbed in 1971 by Western European markets where they serve to pay for imports of industrial goods. Italy remained the largest buyer of Soviet oil, followed by Finland, West Germany, Sweden, and France.

Based on signed trade agreements and the latest Soviet forecasts, petroleum exports from the U.S.S.R. are expected to increase from 105.1 million tons in 1971 to 132 million tons in 1975 and to 166 million tons in 1980.

Crude oil and product exports from the U.S.S.R. to non-Communist countries will continue to grow, perhaps attaining 36 million tons of crude oil and 21 million tons of products by 1975, and 45 million and 24 million tons, respectively, by 1980. In 1980, the Soviet Union may have to import about 10 million tons of crude oil from non–Communist countries in Africa and the Middle East.

Oil exports from the U.S.S.R. to other Communist countries probably will rise from 55.5 million tons in 1971 to 75 million tons in 1975 and 97 million tons in 1980.

Soviet oil deliveries to Japan have temporarily been reduced because of the closure of the Suez Canal, but the situation may change again in a few years, after the completion of the 5,500-kilometer Tyumen-Nakhodka pipeline. A proposal is under negotiation by which Japan may receive 25 to 40 million tons per year, in payment for their proposed financing and assistance in the development of Tyumen oilfields and construction of the pipeline. Some firms of the United States may be participating in a Soviet-Japanese project to develop oil resources in the Tyumen region of Western Siberia.

It is very probable that the Soviet Union will become and importer of crude oil from Iraq, Libya, and Algeria in 1972.

Other Fuels and Energy.—Among the Soviet sources of fuels and energy of lesser significance in the energy economy in 1971 are hydroelectric power, nuclear energy, oil shale, peat, and fuel wood.

Hydroelectric Power.—Hydroelectric power stations generated 125 billion kilowatt hours or 15.6 percent of all electric power supplied in 1971, compared with 16.8 percent during 1970. At the end of 1971, the total capacity of Soviet electric powerplants reached 177 million kilowatts, of which 33 million kilowatts represented hydroelectric capacity (including 1.7 million kilowatts installed in 1971), and over 1 million kilowatts nuclear capacity. There are plans to commission 65 to 67 million kilowatts of new electric-power generating facilities during the 1971–75 plan, including 11.4 million kilowatts of hydroelectric capacity. Production of all electric power is planned to rise to 850 billion kilowatt hours in 1972, 913 billion in 1973, 985 billion in 1974, and 1,065 billion kilowatt hours in 1975. The output of hydroelectric power may reach 165 billion kilowatt hours by 1975 and 215 billion kilowatt hours by 1980.

Exports of electric power rose from 3.9 billion kilowatt hours in 1969 to 5.3 billion in 1970, and to 6.5 billion kilowatt hours in 1971. It is probable that the Soviet Union will export some 9 billion kilowatt hours of electric power by 975, including over 8 billion kilowatt hours to Communist countries and about 1 million kilowatt hours to Finland and Norway. By 1980, the total export of electric power might be about 12 billion kilowatt hours including some 1 billion kilowatt hours to the non-Communist countries. Hungary is expected to remain the principal importer of Soviet power.

Nuclear Power.—The total installed capacity of all four Soviet atomic power plants was 1,370,000 kilowatts or 0.6 percent of the capacity of all electric power plants in the country on December 31, 1971. The third unit (capacity of 440 megawatts) of the Novo-Voronezh plant was put into operation on December 27. According to published data, the Novo-Voronezh plant generated over 7 billion kilowatt hours in the period 1964–71 (including over 1 billion in 1971), and the Beloyarsk atomic powerplant generated over 6.5 billion kilowatt hours in 8 years. All the existing Soviet atomic powerplants are using uranium-235 for fuel.

Although the Soviet planners intend to install between 6 million and 8 million kilowatts of nuclear capacity by 1975, estimated levels of Soviet atomic generating capacity for 1975 and 1980 are 3,224 and 7,168 megawatts, respectively. The U.S.S.R. will probably increase the production of nuclear power from an estimated 4.5 billion kilowatt hours in 1971 to 15 billion in 1975, and 25 billion kilowatt hours by 1980. Nuclear power output is to represent about 1.0 percent of national electric power production and about 0.2 percent of total Soviet primary energy output by 1980.

The Mineral Industry of the United Kingdom

By Horace T. Reno [1]

The economy of the United Kingdom in 1971 measured in current monetary terms was little changed from that of 1970. However, in view of perennial inflation, the economy was judged in worse shape at the end of 1971 than it was in the beginning of the year. The gross domestic output increased 1.5 percent, the industrial output increased slightly, and exports increased almost 14 percent in value compared with those of 1970. But imports increased 9 percent in value and unemployment trended upward from 3.1 percent in the first quarter to 3.7 percent in the fourth quarter, compared with only 2.6 percent unemployment in the last quarter of 1970. A balance of payments surplus of £950 million [2] at yearend compared with £600 million last year, partially offsetting the apparent deterioration of the internal economy.

Activity in the metal and minerals sectors of the economy was counter to the trend in other sectors. A major new tin mine was opened in Cornwall, and the Government took several steps to promote the mining industry. The Overseas Mining Association and the Institute of Mining and Metallurgy established a manpower unit to increase enrollment in mining, metallurgy, and economic geology at the Royal School of Mining, Imperial College of Science and Technology, London. A national university with a network of 250 study centers in 12 regions throughout the United Kingdom was opened with about 7,000 science students enrolled. Post graduate courses in mine planning, applied rock mechanics, mineral valuation, management, and mineral economics were offered by the Department of Mining and Mineral Technology of the Royal School of Mining, London. In the face of opposition from environmentalists, Rio Tinto Zinc was granted permission to prospect for gold in the Mawddach Estuary, and for copper at Cred-y-Brenin in Merionethshire in Wales. Moreover, the Government agreed to consider financing up to 35 percent of the cost in exploring for and evaluating deposits of nonferrous metal ores, barium minerals, fluorspar, and potash.

Crude steel production decreased 15 percent from the record 28 million tons produced in 1970, the nonferrous metals index decreased 6 percent, but indices for coal and petroleum products, chemicals, and bricks, pottery, glass, and other products all increased.

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[1] Physical scientist, Division of Ferrous Metals.

[2] Because of fluctuating exchange rates, a meaningful conversion to U.S. currency is impractical. At yearend, however, the exchange rate was 1£ = US$2.60.

PRODUCTION

Production indices for mining and the mineral industry were as follows (1963 = 100):

	1970 [r]	1971
Mining and quarrying	78.3	79.7
Manufacturing:		
Ferrous metals	116.6	104.1
Nonferrous metals	109.2	102.4
Bricks, pottery, glass, etc	125.2	132.7
Chemicals	157.9	161.5
Coal and petroleum products	151.1	157.8
All industry	124.1	124.9

[r] Revised.

Source: Central Statistical office (London). Monthly Digest of Statistics. No. 315, March, 1972, pp. 44–45.

Table 1.—United Kingdom: Production of mineral commodities

(Thousand metric tons unless otherwise specified)

Commodity	1969	1970	1971[p]
METALS			
Aluminum:			
Alumina	106	107	99
Metal:			
Primary	34	40	119
Secondary	227	214	189
Cadmium metal including secondary metric tons	245	318	262
Copper, refined:			
Primary (from imported blister) do	49,316	49,437	49,516
Secondary do	148,927	156,807	188,070
Iron and steel:			
Iron ore	12,298	12,018	10,229
Pig iron	16,497	17,506	15,262
Ferroalloys, blast furnace	156	166	154
Steel, crude	26,846	28,316	24,175
Steel semimanufactures:			
Sections	5,596	5,656	5,243
Wire rods	2,092	2,211	1,779
Plates and sheets	9,859	10,804	8,996
Strip	1,955	1,934	1,541
Pipe tube and stock	895	891	[e] 727
Railway track material	274	303	308
Other rolled[1]	903	881	[e] 1,175
Castings and forgings	435	423	398
Total	22,009	22,603	[e] 20,167
Lead:			
Mine output, metal content[e] metric tons	3,000	4,000	4,000
Metal:			
Bullion, from imported ores and concentrates do	39,056	43,768	38,628
Refined[2] do	260,500	287,000	263,600
Magnesium metal including secondary do	2,913	2,756	2,800
Nickel metal, refined, including ferronickel do	29,700	36,700	38,700
Tin:			
Mine output, metal content long tons	1,622	1,695	1,787
Metal:			
Primary do	25,982	21,687	22,787
Secondary do	[r] 2,284	2,427	2,035
Zinc, smelter metric tons	150,993	146,598	116,464
NONMETALS			
Barite and witherite	[r] 19	[e] 19	[e] 19
Calcite	27	26	28
Cement, hydraulic	[r] 17,422	17,057	17,896
Chalk	18,295	16,123	17,317
Clays:			
Fire	1,703	1,731	1,765
Kaolin (china clay)	3,055	3,183	2,771
Potters and ball	830	837	729
Other including shale	37,400	32,086	30,472

See footnotes at end of table.

Table 1.—United Kingdom: Production of mineral commodities—Continued

(Thousand metric tons unless otherwise specified)

Commodity	1969	1970	1971[p]
NONMETALS—Continued			
Diatomite metric tons	12,983	13,762	[e] 13,000
Feldspar (china stone) do	33,102	33,667	[e] 34,000
Fertilizers, manufactured:[3]			
Nitrogenous (N content)	841	710	748
Phosphatic (P_2O_5 content)	444	445	540
Other, gross weight	2,835	2,702	3,005
Fluorspar[4] metric tons	190,298	193,271	244,868
Gypsum and anhydrite	4,596	4,276	4,173
Salt:			
Rock	1,539	1,757	1,857
Brine	1,605	1,733	[e] 7,400
Other[5]	5,582	5,698	
Stone, sand and gravel:			
Chert and flint	15	23	18
Igneous rock and perlite	35,806	36,686	37,569
Limestone including marble	83,935	89,948	93,533
Sandstone including ganister	16,636	16,649	13,173
Slate	70	65	68
Sand and gravel:[6]			
Building sand	18,704	18,382	19,918
Concrete sand	33,252	33,389	32,732
Silica refractory and molding sands	5,550	5,782	5,730
Gravel	56,004	56,823	57,604
Strontium minerals metric tons	11,721	9,501	12,000
Sulfur, elemental, recovered	43	37	44
Talc, soapstone, and pyrophyllite metric tons	10,261	10,953	[e] 11,000
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	198	211	218
Coal:			
Anthracite	3,631	3,684	4,061
Bituminous	149,340	140,879	142,995
Coke:			
Metallurgical	[r] 20,410	20,283	17,644
Gashouse	[r] 3,824	2,349	769
Coke, breeze, all types	2,278	2,010	1,654
Fuel briquets, all grades	1,158	1,204	1,360
Gas:			
Manufactured[7] million therms[8]	3,513	2,390	1,865
Natural[9] million cubic feet	[10] 178,673	391,958	655,758
Petroleum:			
Crude thousand 42-gallon barrels	562	607	1,499
Refinery products:			
Gasoline, aviation do	334	434	524
Gasoline, motor do	86,962	96,483	106,479
Jet fuel do	25,414	27,817	30,650
Kerosine do	19,793	20,769	19,675
Distillate fuel oil do	145,309	167,965	182,435
Residual fuel oil do	254,965	285,565	287,664
Lubricants do	8,411	9,264	10,004
Other do	86,589	87,231	84,213
Refinery fuel and losses do	44,059	46,744	45,103
Total do	671,836	741,772	766,747

[e] Estimate. [p] Preliminary. [r] Revised.

[1] Includes wheels, tires, and axles, and semis for sale.

[2] Includes lead refined from imported bullion and secondary lead.

[3] Year ending May 31 of that stated.

[4] Includes fluorspar recovered from old mine dumps.

[5] Salt in brine other than for salt making.

[6] Categories revised from those used in previous editions owing to changes in source.

[7] Gas made at gasworks plus purchased coke oven and refinery gas.

[8] 1 therm =100,000 British thermal units.

[9] Gross production and marketed production not reported separately but regarded as virtually equal.

[10] Gross production of which 99.7 percent was sold to consumers.

TRADE

Trade in mineral commodities in 1971 accounted for approximately 19 percent of the value of all exports and 28 percent of the value of all imports by the United Kingdom. A trade deficit of approximately $2.5 billion could be attributed to mineral commodities. Compared with trade in 1970, the total value of the United Kingdom's trade increased by approximately $1.9 billion in imports and $2.7 billion in exports.

The par value of the pound sterling in terms of United States dollars was changed from 1£ = US$2.40 to 1£ = US $2.60 effective December 21, 1971.

The approximate values of major mineral commodities traded in 1971 were as follows:

	Million dollars	
	Export	Import
Petroleum, crude	24	2,236
Diamond, gem	911	945
Iron and steel	966	[1]755
Copper	224	450
Refined gold bullion	1,101	799
Petroleum products	479	550
Silver and platinum-group metals [1]	171	201
Aluminum	65	[1]250
Nickel	137	[1]279
Lead and zinc	52	[1]169
Tin	42	[1]84

[1] Including ores and concentrates.

Source: Overseas Trade Accounts of the United Kingdom (December 1971).

Table 2.—United Kingdom: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum:			
Oxide and hydroxide	10,152	3,403	NA.
Metal including alloys:			
Unwrought	22,242	26,503	West Germany 12,363; Norway 1,560; Canada 1,558.
Semimanufactures	40,882	42,306	Ireland 4,439; West Germany 3,782.
Bismuth	357	316	NA.
Chromium	1,282	4,015	France 2,409; Belgium-Luxembourg 967; West Germany 141.
Cobalt oxide and hydroxide	71	346	NA.
Copper including alloys:			
Unwrought	103,585	91,058	Italy 20,594; People's Republic of China 19,729; West Germany 16,190.
Semimanufactures	84,969	99,616	Switzerland 16,819; Poland 9,952.
Gold, unworked or partly worked:			
Bullion, refined thousand troy ounces	10,676	18,173	NA.
Other including leaf do	546	296	NA.
Iron and steel:			
Scrap thousand tons	561	409	Spain 98; Belgium-Luxembourg 89; Netherlands 69.
Pig iron, ferroalloys and similar materials do	112	104	Belgium-Luxembourg 8; Sweden 4; West Germany 2.
Steel, primary forms do	292	277	Spain 123; United States 39; Italy 18.
Semimanufactures:			
Bars, rods, angles, shapes, sections:			
Wire rod do	206	141	West Germany 20; Finland 18; United States 12.
Other bars and rods do	440	534	United States 176; Sweden 28; Canada 23.
Angles, shapes, and sections do	448	478	United States 129; Canada 31; Hong Kong 23.
Universals, plates and sheets:			
Universals and heavy plates uncoated do	387	328	Norway 41; United States 25; Spain 23.
Medium plates and sheets uncoated do	57	69	Sweden 3.
Light plates and sheets uncoated do	664	623	United States 215; Sweden 60; Spain 34.
Tinned plates and sheets uncoated do	361	372	United States 40; Argentina 40; India 25.
Other coated plates and sheets do	244	226	Norway 27; United States 22; Sweden 16.
Hoop and strip do	112	187	Sweden 18; Norway 15; Finland 12.
Rails and accessories do	153	178	France 63; Italy 26.
Wire do	129	144	Canada 13; United States 13; Finland 10.
Tubes, pipes and fittings do	535	635	United States 58; Netherlands 34; Denmark 31.
Castings and forgings, rough do	23	36	United States 5; Sweden 3.
Total do	3,759	3,951	

See footnotes at end of table.

Table 2.—United Kingdom: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS—Continued			
Lead:			
Oxides	6,214	7,369	Sweden 195.
Metal including alloys:			
Unwrought	142,822	153,110	West Germany 53,114; People's Republic of China 26,335; Netherlands 23,776.
Semimanufactures	2,594	2,358	Netherlands 246.
Magnesium including alloys, all forms	1,067	922	France 250; United States 103; West Germany 92.
Nickel including alloys:			
Unwrought	23,491	33,448	West Germany 12,584; France 5,581; Sweden 3,934.
Semimanufactures	12,136	11,660	United States 1,706; West Germany 1,454; France 1,081.
Silver and platinum group including alloys:			
Platinum group thousand troy ounces	1,311	1,225	United States 553; Japan 174; West Germany 137.
Silver do	44,056	37,034	West Germany 10,739; Italy 8,324; France 3,283.
Tin:			
Oxides long tons	404	341	NA.
Metals including alloys:			
Unwrought do	16,419	15,493	U.S.S.R. 4,944; Netherlands 1,625; United States 1,084.
Semimanufactures do	584	1,002	Norway 255.
Zinc:			
Oxide and peroxide	5,634	5,447	NA.
Metal including alloys:			
Unwrought	16,412	15,861	Ireland 3,820; Israel 1,425.
Semimanufactures	6,866	6,510	Netherlands 583.
Other:			
Nonferrous base metal ores and concentrates (excluding radioactive ores and concentrates)	12,084	23,341	Belgium-Luxembourg 5,932; France 4,059.
Nonferrous base metal scrap, ores, concentrates and waste of precious metals, and uranium and thorium ores	45,092	67,132	Belgium-Luxembourg 25,167; West Germany 9,212.
NONMETALS			
Abrasives, natural n.e.s.:			
Crude	5,472	8,523	NA.
Grinding and polishing wheels and stones	7,651	6,867	Sweden 1,087; Finland 455; Italy 217.
Asbestos, crude and waste	4,787	4,745	NA.
Cement thousand tons	347	819	Ireland 147; Ivory Coast 139; Republic of South Africa 67.
Clays and products (including all refractory brick):			
Crude including china and others do	2,603	2,700	Italy 441; West Germany 384; France 280.
Products:			
Refractory (including nonclay bricks) do	185	187	Sweden 24; Netherlands 20; Belgium-Luxembourg 9.
Nonrefractory do	82	80	Australia 12.
Fertilizer materials manufactured, nitrogenous do	301	NA	
Lime	40,590	41,096	NA.
Mineral pigments, natural	5,430	2,982	NA.
Salt thousand tons	519	582	Sweden 180; Nigeria 105.
Stone, sand and gravel do	2,685	4,103	France 607; West Germany 374.
Strontium minerals, celestite	7,667	5,850	NA.
Other n.e.s.:			
Crude including metallurgical wastes not containing recoverable metals thousand tons	724	150	West Germany 85.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	5,561	10,677	Ireland 3,806.
Carbon black	33,996	41,459	Sweden 3,504.
Coal including briquets, all grades thousand tons	3,545	3,492	West Germany 1,442; France 550; Netherlands 380.
Coke do	1,021	1,047	Norway 516; Sweden 131.
Gas, natural and manufactured do	55	89	Ireland 21; Spain 13; Belgium-Luxembourg 12.

See footnotes at end of table.

Table 2.—United Kingdom: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum:			
Crude and refined_____thousand tons__	r 3,225	9,961	Ireland 2,727.
Refinery products:			
Gasoline (including natural) _do____	1,043	1,497	Denmark 297; Sweden 266; Netherlands 210.
Kerosine_________________do____	1,013	1,141	Ireland 327; Sweden 187; Norway 185.
Distillate fuel oil___________do____	5,079	5,631	Sweden 1,762; Denmark 1,594; Netherlands 739.
Residual fuel oil___________do____	5,999	7,944	Sweden 2,890; Denmark 1,889; Ireland 980.
Lubricants________________do____	589	687	Belgium-Luxembourg 63; Netherlands 62; Denmark 51.
Mineral jelly and wax______do____	5	8	NA.
Other including bitumen and other residues________________do____	206	441	Norway 45; France 21; Canada 13.

r Revised. NA Not available.

Table 3.—United Kingdom: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum:			
Bauxite and concentrate_thousand tons__	478	420	Ghana 273; Greece 76; France 35.
Metal including alloys:			
Scrap_____________________do____	14	15	NA.
Unwrought_________________do____	358	385	Canada 169; Norway 110; Ghana 37.
Semimanufactures___________do____	47	78	Belgium 13; United States 12.
Bismuth metal including alloys:			
Metal_____________________________	335	318	NA.
Alloys____________________________	241	185	NA.
Cadmium metal including alloys, all forms___	1,388	1,179	NA.
Chromite_________________thousand tons__	199	165	Republic of South Africa 93; Philippines 28.
Cobalt:			
Oxide and hydroxide_________________	611	1,463	Canada 1,349.
Metal including alloys, all forms________	1,465	2,357	United States 1,888; Canada 468.
Copper:			
Ore and concentrate__________________	NA	6,240	Australia 3,201; Chile 1,015.
Metal including alloys:			
Scrap___________________________	8,280	12,519	United States 3,310; Canada 1,702; Ireland 1,424.
Unwrought, unrefined and refined blister__________thousand tons__	473	450	Zambia 150; Canada 105; Chile 71.
Semimanufactures____________________	11,155	12,713	Canada 3,714; Finland 2,201.
Gold:			
Metal unworked and partly worked, fine basis:			
Refined_____thousand troy ounces__	12,875	29,387	NA.
Unrefined_________________do____	767	1,067	NA.
Iron and steel:			
Ore and concentrate except roasted pyrite______________thousand tons__	18,261	19,915	Canada 4,644; Norway 2,642; Liberia 2,078.
Roasted pyrite_________________do____	201	274	Sweden 224; Spain 30.
Scrap___________________________do____	294	266	NA.
Pig iron including cast iron, powder and shot_______________________do____	190	449	Norway 161.
Ferroalloys:			
Ferromanganese____________do____	96	75	Norway 38; Republic of South Africa 21.
Other____________________do____	234	256	Norway 109; Canada 27; Republic of South Africa 13.
Steel, primary forms____________do____	1,125	1,205	United States 598; Spain 116.
Semimanufactures:			
Bars, rods, angles, shapes and sections:			
Wire rod_______________do____	58	50	Sweden 10; Czechoslovakia 3.
Other bars and rods____do____	272	334	Netherlands 68; Norway 61; France 28.
Angles, shapes and sections do____	36	40	Sweden 6; Belgium 6.
Universals, plates, and sheets:			
Heavy and medium plates and sheets, uncoated______do____	135	80	Sweden 10; Austria 5; West Germany 5.
Light plates and sheets, uncoated____________do____	335	307	Netherlands 143; West Germany 48; Austria 28.
Other coated plates and sheets do____	42	22	Canada 5; Austria 4; Sweden 3.

See footnotes at end of table.

Table 3.—United Kingdom: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS—Continued			
Iron and steel—Continued			
Semimanufactures—Continued			
Hoop and strip thousand tons	41	31	West Germany 7; United States 5; Sweden 5.
Wire do	10	12	Sweden 5; Belgium 2.
Tubes, pipes, and fittings do	169	126	Japan 36; Sweden 22; Austria 16.
Castings and forgings, rough do	3	4	NA.
Total do	1,101	1,006	
Lead:			
Ore and concentrate do	71	66	Peru 27; Australia 16.
Metal including alloys:			
Scrap	1,450	4,539	Netherlands 1,307.
Unwrought thousand tons	229	256	Australia 206; Canada 41.
Semimanufactures	889	939	Ireland 735.
Magnesium including alloys:			
Scrap	212	438	NA.
Unwrought	5,682	5,447	Norway 2,805; Canada 1,901; United States 298.
Manganese ore and concentrate thousand tons	438	522	Republic of South Africa 151; Brazil 133.
Mercury 76-pound flasks	22,184	10,018	Italy 3,499; United States 1,353.
Molybdenum ore and concentrate	12,918	11,716	NA.
Nickel:			
Matte, speiss, and similar materials	47,142	73,423	Canada 69,723.
Metal, including alloys:			
Scrap	5,444	4,964	United States 2,259.
Unwrought	23,089	35,057	Canada 26,111; Norway 4,759.
Semimanufactures	1,964	1,363	United States 642.
Platinum group including alloys, all forms thousand troy ounces	168	186	Republic of South Africa 72; U.S.S.R. 32; United States 27.
Selenium, elemental	224	184	NA.
Silicon, elemental	16,690	17,610	All from Italy.
Silver bullion, fine basis:			
Refined thousand troy ounces	104,234	38,021	NA.
Unrefined do	19,650	11,933	NA.
Titanium ore and concentrate:			
Ilmenite thousand tons	260	346	NA.
Other do	45	50	NA.
Tin:			
Ore and concentrate long tons	74,805	68,939	Bolivia 55,741; Argentina 5,625; Australia 2,175.
Metal including alloys:			
Scrap do	1,141	1,112	United States 286; Netherlands 253.
Unwrought and semimanufactures do	7,117	6,552	Nigeria 5,863.
Tungsten ore and concentrate	8,422	10,412	United States 2,535; Bolivia 2,308; Portugal 1,029.
Zinc:			
Ore and concentrate thousand tons	334	301	Australia 202; Canada 55.
Metal including alloys:			
Scrap	1,217	434	NA.
Unwrought thousand tons	165	164	Canada 100; Australia 18; Bulgaria 12.
Semimanufactures	1,235	501	Belgium 74.
Zirconium ore and concentrate	48,184	27,427	NA.
Other:			
Ores and concentrate thousand tons	19	438	Australia 293; Norway 85; Canada 27.
Ash and residues containing nonferrous metals do	88	74	Canada 40; Trinidad and Tobago 7.
Base metals including tungsten, molybdenum, and tantalum do	28	11	United States 2; Zambia 2; Republic of South Africa 2.
NONMETALS			
Abrasives, natural excluding diatomite thousand tons	65	69	Italy 44; United States 2.
Asbestos, crude do	180	154	Canada 97; Republic of South Africa 27; Swaziland 20.
Barite and witherite do	56	66	Morocco 26.
Borax do	13	13	France 4.
Cement do	183	103	Ireland 38; Denmark 16.
Clays and products (including all refractory brick):			
Crude n.e.s.[1] do	136	168	United States 92; Republic of South Africa 40.
Products:			
Refractory (including nonclay bricks) do	69	80	Austria 19; Ireland 17.
Nonrefractory do	13	13	West Germany 3; Portugal 2; Japan 2.

See footnotes at end of table.

Table 3.—United Kingdom: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
NONMETALS—Continued			
Diatomite and other infusorial earths thousand tons	40	34	Denmark 25; United States 4.
Feldspar and fluorspar do	139	162	Norway 103; Finland 28; Canada 20.
Fertilizer materials:			
Crude:			
Nitrogenous do	r 13	12	Chile 10.
Phosphatic do	1,693	1,597	Morocco 1,064; Senegal 166; Israel 113.
Potassic do	37	24	East Germany 20.
Other do	27	4	NA.
Manufactured:			
Nitrogenous do	283	247	NA.
Phosphatic do	52	77	Belgium 6; Netherlands 3.
Potassic do	748	815	East Germany 271; West Germany 108; France 107.
Other, including mixed do	296	231	Netherlands 152; West Germany 30; France 11.
Graphite, natural	10,454	11,944	Malagasy Republic 4,047; Ceylon 1,176.
Gypsum and plasters thousand tons	168	144	Ireland 101.
Magnesite do	124	120	Spain 37; Greece 35.
Mica, crude including splittings and waste do	12	13	Republic of South Africa 7; India 2.
Pigments, mineral, crude, natural	5,845	5,262	NA.
Pyrite (gross weight) thousand tons	221	170	Cyprus 94; Sweden 32; U.S.S.R. 16.
Salt do	54	140	NA.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked do	31	32	NA.
Worked do	24	20	Portugal 11.
Dolomite do	27	22	Norway 5.
Gravel and crushed rock do	224	226	Ireland 102; Norway 45; Italy 36.
Quartz and quartzite do	8	14	Brazil 1.
Sand excluding metal bearing do	223	203	Belgium 167; Netherlands 20.
Sulfur, elemental do	744	821	France 275; Poland 198; United States 119.
Talc, steatite, soapstone, and pyrophyllite do	52	58	Norway 16; France 14; People's Republic of China 10.
Other n.e.s.:			
Crude do	396	--	
Slag, dross, and similar waste, not metal bearing	3,745	9,288	Netherlands 2,049.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural thousand tons	50	52	Trinidad and Tobago 32; France 14.
Carbon black do	12	12	United States 8.
Coal and coke including briquets do	91	231	Ireland 88.
Gas, natural and manufactured do	1,131	929	Algeria 669.
Petroleum:			
Crude and partly refined do	r 688,368	766,541	Libya 187,537; Kuwait 175,740; Saudi Arabia 110,968.
Refinery products:			
Gasoline (including natural) do	4,204	7,669	Italy 1,906; Netherlands 1,777; France 1,061.
Kerosine and jet fuel do	6,178	1,146	Netherlands 309; Yemen 246; Italy 184.
Distillate fuel oil do	2,994	1,916	Italy 448; Netherlands 263; Kuwait 200.
Residual fuel oil do	6,228	8,993	Netherlands 3,902; Italy 1,124; France 930.
Lubricants do	531	530	Netherlands 128; Antilles 125; United States 87.
Mineral jelly and wax do	186	154	Antilles 78; Netherlands 26; United States 12.
Petroleum coke do	91	143	United States 110; Belgium 12.
Other do	56	107	Belgium 86; United States 2.
Total do	20,468	20,658	

r Revised. NA Not available.

[1] Includes andalusite, kyanite, etc.

COMMODITY REVIEW

METALS

Aluminum.—Primary aluminum production in 1971 was 200 percent higher than in 1970 as three new smelters began operations. However, completion of the new smelters coincided with a world surplus of aluminum. Planned production of the new plants was curtailed as the entire industry was depressed. Late in the year major producers reduced their labor force by about 10 percent.

Preliminary data indicate that the pattern of aluminum consumption in 1971 was little changed from that of 1970; approximately one-fourth of the total was used to make vehicles and about 15 percent was used in electrical engineering materials. The remainder was distributed among building construction, mechanical engineering materials, packaging, iron and steel and other metal producing industries, and miscellaneous industries.

Exports of semifinished aluminum shapes totaled 75,442 tons, almost double those of 1970. Imports of unwrought aluminum and aluminum alloys totaled 269,681 tons, down almost 30 percent. Thus increased exports and decreased imports brought supply into better balance with demand, partly offsetting the large increase in domestic output of primary aluminum.

Copper.—There was a great deal of speculation in technical and trade journals about the possibility of the United Kingdom again becoming a major copper producer inasmuch as solution to the problem of mineral rights ownership apparently was in sight. Moreover, the Government opened to mineral exploration Snowdonia National Park which covers sections of known copper occurrences. At yearend significant copper mineralization had not been reported and the United Kingdom continued to be completely dependent on imported blister and matte and secondary materials for copper.

Iron Ore.—The significance of domestic mines in supplying iron ore needs of the steel industry continued to decline. However, as in 1970, domestic ore comprised 37 percent of the total ore consumed; foreign ore 63 percent.

In 1971 Canada, Sweden, Venezuela, Mauritania, Brazil, the U.S.S.R., and Norway, in that order, were the principal, suppliers of iron ore to the United Kingdom (over 1 million tons). Sweden regained its position of second rank but the relative positions of Liberia and Norway were much lower; these two countries ranked third and second, respectively, in 1970. Apparently, the pattern of iron ore supply had not yet stabilized after changes took place stemming from completion of new deepwater ports and after more diversified sources were used.

In all probability, the changing pattern of iron ore supply and consequent changes in grade and structure of ore consumed affected smelting operations. However, other changes in the industry, its depressed state, and recent change from private to public ownership may have modified or obscured the true pattern. The 5-year trend of increased use of scrap apparently was reversed as the pig to scrap ratio was 1.12 to 1.0. The use of sinter increased compared with 1970, the coke rate followed the past downward trend, as did the use of liquid fuel, but the use of gas increased. In view of the new supply of natural gas, it seems logical to assume that gas replaced some of the other fuels.

Lead and Zinc.—Lead concentrate production was little changed from that of 1970; most concentrates were a byproduct of fluorspar mining in Derbyshire. Production of 38,628 tons of lead bullion was 12 percent less than in 1970. Refined lead production from domestic ores, scrap, and imported bullion totaled about 264,000 tons, 8 percent less than was refined in 1970. Lead consumption in all forms totaled 346,000 tons. End uses of lead were little changed from the pattern of the last few years, but its use as an additive to gasoline increased 10 percent compared with that of 1970.

The most notable event in the lead-zinc industry was the closing of the 30-year-old Avonmouth vertical retort plant of the Imperial Smelting Corp. Rio Tinto Zinc Corp., Ltd. (RTZ), the parent company transferred the assets of Imperial Smelting to three new companies which are to deal with chemical manufacture, the land assets and Avonmouth and Swansea, and zinc and lead smelting operations. All smelting operations at the Avonmouth works are to be in the No. 4 imperial furnace complex which was completed in 1967.[3]

Steel.—Crude steel production in the United Kingdom in 1971 was the lowest since the industry was nationalized in 1966. Output was about 1 million tons less than planned and the shortfall was made up by imports of primary steel. British Steel Corp. (BSC) operated at a loss of approximately $5 million per week in the latter part of the year. Nevertheless, the Secretary for Trade and Industry announced in the House of Commons that the Government had decided to maintain within the corporation the responsibilities for bulk iron and steelmaking. The decision was made in view of the economies of scale possible in modern integrated steelworks. Planned BSC steelmaking capacity was set by the Government to range between 28 and 36 million ingot tons by 1980.

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[3] The Rio Tinto Zinc Corporation Limited. Annual Report and Accounts 1971. P. 34.

Despite the BSC's deficit operations, the Government in April ordered the corporation to cut a proposed price increase from an average of 14 percent to an average increase of only 7 percent. The full increase was denied on the grounds that it would damage the competitive position of British industry. Reportedly, the 14 percent increase would not have brought British steel prices to parity with those prevailing in the United States at the time. However, the Government may have relaxed its firm control over prices later in the year. In September it was reported that approximately 15 percent of the nationalized industry would be returned to private enterprise. At the same time the Government apparently agreed to let the operating corporation set prices by allowing selective price increases.

The BSC announced in April that it would close nine plants in the General Steels Division and one in the Tube Division, affecting 7,256 employees as shown in the following tabulation:[4]

Plant	Employees affected
General Steels Division:	
Cleveland No. 6 mill, S. Teesside	289
Lackenby No. 11 mill, S. Teesside	96
Normanby Park open hearth furnaces, Scunthorpe	179
Dalzell No. 5 mill, Motherwell	131
East Moors light section mill, Cardiff	210
Redbourn bar mill, Scunthorpe	62
Irlam iron and steelmaking, primary mill and ancillary services, Manchester	1,961 (stage 1) 2,393 (stage 2)
Hartlepool light plate mill	609
Cargo Fleet ironworks and associated services, S. Teesside	1,038
Tube Division:	
Great Bridge Works, near Tipton	288
Total	7,256

Plans were made to utilize some of the workers in other steel installations, inasmuch as the corporation paid particular attention to concentration of steelmaking at the point of lowest cost. Closing the plants was a matter of great concern because it came at a time when unemployment throughout the United Kingdom was at a high level.

Nevertheless, major construction continued at Scunthorpe, Teesside, and the Rotherham areas. The Anchor expansion project at Scunthorpe was on schedule. New investments there totaled about $500 million. When completed it will be the largest steel plant in the United Kingdom. About $200 million was being invested in the Teesside area to build, among other things, a new deepwater ore terminal at Redcar and new oxygen steel plant. The Temple Borough melting shop in the Rotherham area, which was already the largest electric steelmaking facility in the world, was being increased. The corporation decided to develop a deepwater port and iron ore terminal in Scotland on the Clyde estuary and was planning an integrated steelworks there.

The BSC's research and development spans the field of the corporation's activities. In general, the corporate laboratories evolved from those formerly operated by the British Iron and Steel Research Association (BISRA). To administer the new operation a research committee was formed to keep under review and coordinate the research and development work of the divisional and corporate laboratories. Technical committees were formed covering iron and steelmaking, properties of steel, quality, corrosion and protection, instrumentation, control engineering, energy utilization, handling, and transport. Special study groups were formed within this framework to keep under review particular fields of innovation which may affect iron and steel production and that may require further research or development.

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[4] Metal Bulletin. Ten Plants To Be Closed. No. 5593, Apr. 23, 1971, p. 29.

In 1971 corporation scientists conducted research projects in coal, coke, and ore preparation; blast furnace operations and control, including direct reduction; steelmaking and casting; fuel; furnaces; toolmaking; forging and extrusion; wire drawing; process metallurgy; product development; chemicals; slags and slag utilization; operation and environmental research; corrosion; welding; and machining. The corporation announced noteworthy progress as follows: (1) A project for widening the range of coal suitable for coking by means of a preheating technique originally developed at the British Coke Research Associations laboratories (a full-scale trial of the process was managed by the corporation's chemical division); (2) procurement and installation of a novel, automatically controlled rod and bar mill; (3) advanced design of a slab reheating furnace; and (4) a 54-inch strip aluminizing line commissioned at Shotwick in the strip mills division.[5]

Tin.—Tin mine production of 1,787 long tons was 5 percent more than in 1970 and the highest since 1968. The Cornwall mining district regained some of its past eminence as two more mines were brought into production. The Pendarves mine operated by Camborne Mines Ltd. began producing tin ore in October, and the Wheal Jane mine operated by Consolidated Gold Fields Ltd. which began producing in July was formally commissioned on October 1. Pendarves ore was trucked to the Cornish Tin Smelting Co., Ltd. plant at Roscroggan and the Wheal Jane ore was concentrated at the mine site by flotation to remove iron, copper, and arsenic sulfides followed by conventional gravity methods to obtain a 50-percent coarse concentrate. The coarse concentrate was shipped to the Williams, Harvey and Co. Ltd. smelter in Liverpool. Lower grade fine concentrate was shipped to Cooper Pass and Son Ltd. at North Ferriby, Yorkshire, for further processing.

Production of refined tin totaled 24,822 long tons, 22,787 from primary material and 2,035 tons from secondary material.

Exports of refined tin including reexports totaled 9,401 long tons of which 1,673 tons went to Poland, 1,623 tons went to the Netherlands, and 1,412 tons went to the U.S.S.R. Imports of tin and concentrate contained 18,563 tons of tin. As in the past, Bolivia was the principal supplier.

Consumption of tin totaled 17,802 tons of which 1,637 tons was secondary. The consumption pattern was changed little from past years except that its use in bronze and gunmetal was down about 15 percent from the 1970 level and from the average of the last 5 years.

The plant expansion of Cooper Pass and Son, a subsidiary of RTZ at North Ferriby Yorkshire, was commissioned in the second quarter of 1971. This plant was designed to process principally low-grade Bolivian tin ores; the expansion permitted ready acceptance of ores from the newly opened Cornish Wheal Jane mine.

Tungsten.—Worldwide Energy Co. Ltd. of Canada formed a United Kingdom subsidiary to purchase the Carroch Fell tungsten mine in Cumberland. Caroch Fell was last worked in 1943. It is noted for the variety of its minerals; wolframite and scheelite are the principal tungsten minerals.

NONMETALS

Fluorspar.—Geologists of the Universities of Leicester and Sheffield evaluated the fluorspar mining potential of the Derbyshire ore field.[6] Fluorspar in Derbyshire is mainly in hydrothermal veins and fissure fillings in carboniferous limestone of the south Pennines. Associated minerals are galena, sphalerite, barite, and calcite. The district has been mined for lead for more than 2,000 years, and since all the ores contain some lead minerals, ancient, complex lead mining laws apply to the fluorspar mining operations.

Fluorspar mining in Derbyshire in 1971 ranged from small, two-man mines to one of the world's largest fluorspar mining operations conducted by Laporte Industries Ltd. The C. E. Guilin group of companies, Europe's largest fluorspar producer commissioned an 80,000-ton-per-year acid-grade flotation plant late in the year.

Potash.—Cleveland Potash, Ltd., was sinking two 18-foot diameter circular shafts under contract at its Boulby mine near Straithes in North Yorkshire. However,

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[5] British Steel Corporation. Steel Research '71. Published by the British Steel Corporation, Res. and Development Dept. 48 pages, 4 appendixes.

[6] Ford, T. D., and P. R. Ineson. The Fluorspar Mining Potential of the Derbyshire Ore Field, Institution of Mining and Metallurgy. V. 80, No. 77, August 1971, pp. B186–B210.

Yorkshire Potash Ltd., a subsidiary of RTZ, completed exploration and evaluation of potash deposits in the Whitby area, but after finding the geology of the ore body to be more complex than first indicated and in view of the world market conditions decided not to continue further exploration. Whitby Potash Ltd. which was owned jointly by Armour and Co. and Shell Petroleum Ltd. came to the same decision when Armour withdrew from the project.

Sand and Gravel.—A comprehensive review covering areas of occurrence and production was made of the sand and gravel industry of the United Kingdom.[7] Sand and gravel, principally from river beds, is in plentiful supply in most of the densely populated areas. The Thames and Trent Valleys being rich in deposits and near the largest concentrations of population are the major sources. The pattern of sand and gravel production closely follows the geographical pattern of markets. Sand and gravel production, 1964–70, by region, in thousand metric tons, including material produced from rivers and beaches was as follows:

Region	1964	1965	1966	1967	1968	1969	1970
East Anglia	7,311	7,597	7,383	7,892	8,054	8,274	7,971
East Lincolnshire	582	553	621	761	674	547	572
East Yorkshire	775	687	809	929	975	915	1,050
Greater London	18,527	17,777	18,453	20,009	19,735	18,431	18,092
Kent and East Sussex	2,844	2,921	3,334	3,726	3,883	4,111	3,971
Lower Severn	1,363	1,406	1,209	1,245	1,363	1,344	1,368
Middle Anglia	4,674	4,307	4,490	5,031	4,995	4,903	5,402
Middle and Upper Thames	7,892	8,689	9,040	10,163	9,603	9,765	11,936
North East	4,870	4,397	4,859	4,910	4,849	4,792	4,363
North West	9,664	9,594	9,575	10,627	10,766	11,696	12,358
South West	3,125	2,822	2,670	2,864	3,009	3,002	2,965
Trent Valley	9,167	8,014	7,839	7,791	7,706	7,055	7,134
Wessex	7,559	7,619	7,625	8,024	8,052	7,408	6,934
West Midlands	7,866	8,171	8,482	8,400	8,644	8,803	8,233
West Yorkshire	5,298	5,038	6,360	5,921	5,298	4,669	4,978
Total for 15 regions	91,517	89,592	92,749	98,293	97,606	95,715	97,817
Total for Wales (part)	9,199	2,528	2,323	2,292	2,245	2,351	2,531
Total for Scotland	3,995	8,877	9,361	9,923	10,406	9,894	8,558
Total for Great Britain	104,711	100,997	104,433	110,508	110,257	107,960	108,406

Source: Department of the Environment.

Production of concrete aggregate minerals in the United Kingdom by type, 1960–70, in thousand long tons follows:

United Kingdom production of aggregate minerals[1]

Year	Sand and gravel[2]	Limestone	Sandstone[3]	Igneous rock
1960	70,376	40,079	4,959	16,265
1961	81,708	41,913	4,903	17,394
1962	81,866	44,053	5,238	18,281
1963	85,568	47,122	5,310	18,963
1964	102,973	57,078	6,820	22,948
1965	100,474	59,592	7,267	24,816
1966	102,525	66,778	7,981	28,258
1967	107,755	76,183	9,878	33,681
1968	107,573	79,906	13,707	33,536
1969	104,133	82,609	16,373	35,240
1970	[4] 103,279	[4] 86,425	[4] 16,190	[4] 36,376

[1] Total output; but not all limestone, sandstone, and igneous rock is used as aggregate.
[2] Does not include marine-dredged material.
[3] Includes silica stone, ganister, grit and conglomerate.
[4] Provisional.

Source: Department of Trade and Industry.

More than 1,000 concerns were engaged in sand and gravel production in the United Kingdom in 1971; 490 produced stone and slate, and 280 produced limestone, of which 160 produced ground limestone. It was estimated that average annual production of a sand and gravel pit was 37,200 cubic yards in 1957 and 66,900 cubic yards in 1969, an increase of 80 percent in 12 years.

MINERAL FUELS

Coal.—Labor strife again marked the coal industry as in 1970. The National Union of Mines banned overtime on November 1 in protest against a 7-percent wage increase offered by the National Coal Board. The union demanded up to a 45-

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[7] Industrial Minerals. Aggregates in the United Kingdom. No. 49, October 1971, pp. 9–23.

percent increase and voted, three to two on December 2, to strike all nationalized mines. At yearend labor and management were still far apart in negotiations on wages.

Coal Production 1970–71 was down 4 percent from the 1969–70 low, but opencast mines increased output more than 25 percent. The National Coal Board reported 292 collieries operating at the end of the period compared with 299 the year before. Output per man-shift at the face underground increased 4 percent to a new record. There were 92 fatal accidents compared with 82 the previous period, but the accident rate of 135.8 per 100,000 man-shifts was the lowest since 1958.

United Kingdom exported 2.7 million tons of coal in 1971 compared with 3.3 million in 1970; by far the largest part went to the European Economic Community countries. Coal imports totaled 4.2 million tons, valued at $102.4 million compared with only 78,000 tons valued at $2.4 million in 1970.

Natural Gas.—North Sea natural gas continued to dominate the United Kingdom gas industry. Production in the North Seafield was 656 billion cubic feet compared with 392 billion cubic feet in 1970. The Gas Council program to convert consumer appliances to natural gas and phase out oil-based production plants proceeded on schedule. The national transmission system was extended 303 miles. A 24-inch pipeline was installed across the River Thames to form part of a loop that will encircle London and supply gas to Southeast England. The sources of gas available in the United Kingdom for fiscal years ending 1970 and 1971 were as follows:

	Million therms	
	1969–70	1970–71
Gas (manufactured):		
Coal gas	427	238
Oil gas	1,747	1,207
Water gas and other gases	46	32
Gas (purchased):		
Refinery gas	227	134
Liquefied petroleum gas	272	206
Coke oven gas	330	279
Other (including natural gas used in gas manufacture)	1,958	2,487
Subtotal	5,007	4,583
Natural gas direct to consumers	737	2,157
Total gas available	5,744	6,740

Source: Gas Council Annual Report and Accounts 1970–71.

Petroleum.—A United States British group of companies headed by a subsidiary of Standard Oil Co. (Indiana) and the Government-owned Gas Council apparently discovered a fourth major oilfield in the North Sea.[8] The initial discovery was made in 1969 in the British sector about 135 miles east of Aberdeen, Scotland. A test flow of 4,000 barrels per day of high-quality crude from a well 6 miles north indicated presence of a major new field. Although the discovery well tested 2,200 barrels of oil and about 1 million cubic feet of gas per day, and the latest well produced about 2 million cubic feet of gas per day, the field could not yet be considered proved for commercial production of either gas or oil.

The Department of Trade and Industry opened 436 blocks comprising an area of about 43,000 square miles in the North Sea for oil and gas exploration. Fifteen of the blocks were offered at sealed-bid auction for licensing, the first time that the Government used this method of selecting licensees. Licenses to explore the remaining 421 blocks were to be awarded as in the past on assessment of the applicants known capabilities, resources, and past performance.

According to some observers, developments in the North Sea have come so fast that their full implication on the economy of the United Kingdom and the Government was not clear in 1971. Refining capacity was increased about 8 percent, from 114 million tons per year in 1970 to 123 million tons (175,000 barrels per day) in 1971. Consumption in 1971 was only slightly higher than in 1970, principally because North Sea natural gas was used in place of imported petroleum. Although the Government opened the 43,000-square-mile area for exploration, encouraged by recent successes, it had not yet developed licensing and taxation policy to assure the greatest benefit to the country. Private industry and the communities on the northern shores had not yet planned to take full advantage of the United Kingdom's pending change to practical self-sufficiency in petroleum.

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[8] Wall Street Journal. U.S. British Group Has Oil-Gas Discovery, Apparently Fourth Major North Sea Field. V. 178, No. 100, Nov. 22, 1971, p. 30.

The Mineral Industry of Venezuela

By Gordon W. Koelling[1]

The value of Venezuela's crude minerals output was adversely effected in 1971 by the decreased production of crude oil and iron ore. Approximately 94 percent of crude minerals output value was accounted for by the petroleum industry (including natural gas) which also was responsible for approximately 25 percent of gross domestic product (GDP), provided about 67 percent of the Government's ordinary revenues, and was responsible for over 90 percent of the country's total export receipts. About 5 percent of the value of Venezuela's crude minerals output was accounted for by iron ore.

Despite a 4 percent decline in crude oil output, Venezuela remained the world's third leading petroleum exporting country behind Saudi Arabia and Iran and retained fifth place among the world's crude oil producing nations. This drop in production reflected some of the basic problems of the Venezuelan petroleum industry. Reserves of crude oil declined for the sixth consecutive year and production costs remained high in comparison with those in other major petroleum exporting countries. In addition, rapidly declining tanker rates further eroded the advantage of Venezuela's geographic proximity to consumers in the Western Hemisphere. A number of actions taken by the Government to increase its income from and its control of the petroleum industry also resulted in a rise in the price of Venezuelan petroleum exports and tended to make additional investment in exploratory activity less attractive to most private companies.

In accordance with the provisions of the Law for Partial Reform of the Income Tax Law enacted in December 1970, the Venezuelan Government revised the price of petroleum exports to be used for tax calculations (these arbitrarily determined prices are called Tax Reference Values) during 1971. These price revisions raised the tax price of petroleum products and crudes of differing gravities by amounts varying from 38.5 to 92.0 U.S. cents per barrel. A decree issued near the end of December 1971, further increased the Tax Reference Values of crudes and various petroleum products by amounts ranging from 9 to 84 U.S. cents per barrel.

The above decree also established petroleum export controls which are to operate through a penalty clause that will apply whenever a company's exports during any quarter of 1972 fall more than 2 percent below that firm's shipments during the corresponding quarter of 1970. Penalties ranging from 1 to 10 percent of Tax Reference Value are to be assessed against all petroleum exports of a company in any quarter during which its total shipments fall below the specified minimum with the maximum penalty rate applying in case of shortfalls exceeding 8.9 percent. Penalties are also to be assessed when any firm's quarterly export quantities exceed those of the corresponding quarter of 1970 by more than 4 percent. However, such penalties are to apply only to the incremental shipments during the quarter rather than to the total quantity exported.

In July 1971, the Law Concerning Property Subject to Reversion in Hydrocarbons Concessions was signed by the President. This law declares that essentially all facilities for exploration, production, refining, or transportation within petroleum concessions, or existing for the fulfillment of the obligations derived from such concessions, are to revert to the Government upon the expiration of petroleum concession agreements. It also requires the maintenance of a guaranty fund to which concessionaires are to make contributions consisting of up to 10 percent of the cost accepted by the Income Tax Administration for the depreciation of the assets subject to reversion. These contributions are to be made over a 5- to 10-year period.

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[1] Geographer, Division of Fossil Fuels.

Proposals advanced by U.S. firms for joint ventures involving the construction of natural gas liquefaction facilities were nullified in August 1971 by the promulgation of a law reserving the natural gas industry to the State. This law requires, among other things, that the liquefaction of natural gas must be carried out directly by the Government petroleum entity—Corporación Venezolano del Petróleo (C.V.P.). The law also specifies that only dissolved and associated gas not used for field injection or other ends suitable to the public interest may be liquefied. In effect, this limits the gas available for liquefaction to those quantities being flared.

A Conservation Decree issued in December 1971 authorizes the Ministerio de Minas e Hidrocarburos to control levels of oil production and exploration. Under the terms of this decree, oil companies must maintain a level of exploration considered by the Ministerio to be sufficient in relation to the level of production. The companies are also required to submit to the Ministerio an outline of their annual programs for exploration, production, sales, and investments as well as a list of concession areas they propose to relinquish in lieu of exploration.

PRODUCTION

Output of a number of minerals produced in Venezuela declined during 1971. The most significant declines were registered by crude oil, total refinery output, natural gas, iron ore, and manufactured fertilizer materials. Coal production increased only slightly but natural gas liquids registered a sharp increase in production.

Table 1.—Venezuela: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1969	1970	1971 [p]
METALS			
Aluminum, unalloyed ingot	[r] 17,200	22,900	24,000
Gold, mine output ... troy ounces	19,385	21,862	19,162
Iron and steel:			
Iron ore and concentrate ... thousand tons	19,716	22,100	20,500
Pig iron ... do	520	510	[e] 510
Crude steel ... do	821	923	[e] 950
NONMETALS			
Cement, hydraulic ... do	2,080	2,650	[e] 2,700
Diamond:			
Gem ... carats	117,614	[r] 131,106	[e] 109,100
Industrial ... do	76,169	[r] 377,555	[e] 390,900
Total ... do	193,783	[r] 508,661	[e] 500,000
Fertilizer materials:			
Crude, phosphate rock, marketable	62,000	30,983	49,101
Manufactured, nitrogenous, gross weight	151,882	201,909	134,189
Gypsum [e]	82,000	100,000	100,000
Salt, all types	171,000	265,396	[e] 260,000
Stone, limestone only ... thousand tons	2,700	NA	NA
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	7,258	7,348	[e] 7,500
Coal, bituminous	32,484	39,985	41,000
Gas, natural:			
Gross production ... million cubic feet	1,673,013	1,710,200	1,680,252
Marketed ... do	314,092	348,630	368,230
Natural gas liquids:			
Condensate ... thousand 42-gallon barrels	1,999	1,899	1,710
Natural gasoline ... do	3,048	3,882	5,898
Liquefied petroleum gas ... do	8,773	11,141	16,392
Total ... do	13,820	16,922	24,000

See footnotes at end of table.

Table 1—Venezuela: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity [1]		1969	1970	1971 [p]
MINERAL FUELS AND RELATED MATERIALS—Continued				
Petroleum:				
Crude	thousand 42-gallon barrels	1,311,832	1,353,420	1,295,406
Refinery products: [2]				
Aviation gasoline	do	278	185	214
Motor gasoline	do	22,807	26,317	27,625
Naphtha	do	37,195	38,856	40,393
Jet fuel	do	23,773	26,803	15,485
Kerosine	do	5,613	4,301	4,338
Distillate fuel oil	do	55,250	55,149	57,829
Residual fuel oil	do	257,702	297,531	284,145
Liquefied petroleum gas	do	2,809	3,945	3,569
Lubricants	do	3,583	3,852	3,855
Asphalt and bitumen	do	4,816	5,136	5,970
Refinery gas [3]	do	5,673	6,211	6,026
Other	do	2,568	2,578	3,087
Total	do	422,067	470,864	452,536

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, lime, sand and gravel, and clays are also produced, but information is inadequate to make reliable estimates of output levels.

[2] Includes refinery fuels.

[3] Liquid equivalent.

TRADE

Exports of mineral commodities continued to dominate Venezuela's overall foreign trade. The United States was the principal destination of direct petroleum shipments, followed by the Netherlands Antilles. However, almost all of the petroleum shipments to the latter area consisted of crude and unfinished oils destined for processing at two large refineries owned by the parent companies of Creole Petroleum Corp. and Shell de Venezuela, Ltd., Venezuela's first- and second-ranking crude oil producers. These refineries export their output and are, in a sense, an integral part of Venezuela's petroleum industry.

Exports of Venezuela's petroleum from Venezuela and the Netherlands Antilles by principal areas of destination during 1969–1971 were as follows:

Destination	Exports (thousand 42-gallon barrels)		
	1969	1970	1971
Western Hemisphere:			
Canada	161,631	174,799	156,042
Puerto Rico	75,418	74,997	89,499
Trinidad and Tobago	69,929	51,768	26,215
United States	512,673	575,294	559,193
Other	172,949	174,989	172,078
Total	992,600	1,051,847	1,003,027
Eastern Hemisphere:			
Western Europe:			
European Economic Community (EEC)	82,480	73,859	55,901
Spain	23,936	18,820	13,926
United Kingdom	69,253	65,571	75,997
Other	33,947	31,260	28,329
Subtotal	209,616	189,510	174,153
Other	35,275	24,583	20,861
Total	244,891	214,093	195,014
Grand total	1,237,491	1,265,940	1,198,041

Source: Ministerio de Minas e Hidrocarburos. Memoria y Cuenta, Año 1969, 1970, 1971. Caracas, Venezuela, March 1970, March 1971, and March 1972.

Table 2.—Venezuela: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum metal, including alloys:			
Unwrought	217	11,722	Columbia 9,722; Argentina 1,700; Peru 200.
Semimanufactures	--	42	Puerto Rico 16; Jamaica 10; Netherlands 8.
Copper metal, including alloys:			
Scrap	642	521	All to West Germany.
Semimanufactures	19	15	Dominican Republic 13; Italy 2.
Iron and steel:			
Ore and concentrates thousand tons	18,992	21,089	United States 13,180; West Germany 3,246; United Kingdom 1,885.
Metals:			
Pig iron, ferroalloys, and similar materials	--	698	Colombia 400; Uruguay 298.
Steel primary forms	202,405	165,584	Argentina 88,334; Mexico 45,290; Colombia 24,166.
Semimanufactures	29,255	18,481	Italy 8,664; Netherlands Antilles 3,537; Dominican Republic 3,178.
Zinc, metal, including alloys, all forms	--	71	All to Belgium-Luxembourg.
NONMETALS			
Barite and witherite	40	2,531	All to Colombia.
Cement	212,601	204,653	Surinam 59,738; Argentina 42,084; Netherlands Antilles 21,013.
Clays and products (including all refractory brick):			
Crude	60	129	Puerto Rico 116; Colombia 10.
Products	304	695	Netherlands Antilles 679; Surinam 16.
Gypsum and plasters	13,975	13,350	Trinidad and Tobago 11,380; Surinam 1,970.
Lime and limestone	8	24	Netherlands Antilles 24.
Magnesite	16	6	All to the Netherlands.
Precious and semiprecious stones, except diamond kilograms	56	151	United States 75; Netherlands 63; Israel 10.
Salt	146,294	126,317	United States 52,835; Colombia 37,950; Japan 19,550.
Stone, sand and gravel:			
Dimension stone, crude and partly worked	[r] 661	493	Netherlands Antilles 280; Trinidad and Tobago 213.
Sand and gravel	--	2,547	Netherlands Antilles 2,404; Colombia 143.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	373	1,131	Ecuador 449; Costa Rica 95; Nigeria 78.
Coal and coke including briquets	8	2	All to Japan.
Gas hydrocarbon, natural gas liquids:			
Natural gasoline thousand 42-gallon barrels	1,859	2,781	United States 1,933; Brazil 811.
Liquefied petroleum gases do	5,912	7,650	Brazil 2,821; Argentina 1,437; United States 972.
Petroleum:			
Crude and partly refined do	903,728	888,637	Netherlands Antilles 282,862; United States 135,595; Canada 120,019.
Refinery products:			
Gasoline do	509	1,819	France 376; United States 319; United Kingdom 301.
Naphtha do	26,389	32,005	Puerto Rico 16,497; United States 10,621; United Kingdom 1,798.
Kerosine do	96	150	United Kingdom 96; Peru 54.
Jet fuel do	21,684	24,425	United States 18,207; Canada 2,079; Japan 1,516; France 577.
Distillate fuel oil do	32,466	39,055	United States 11,830; Canada 9,510; Sweden 2,668; Netherlands Antilles 1,486.
Residual fuel oil do	252,335	272,148	United States 215,444; Canada 15,125; Netherlands Antilles 7,936; Panama Canal Zone 5,959.
Lubricants do	2,915	2,903	United Kingdom 1,084; Sweden 574; Argentina 539.
Other do	2,490	2,707	Argentina 803; Brazil 682; France 172.
Asphalt do	2,324	2,557	United States 2,006; Costa Rica 95; Nigeria 78.

[r] Revised.

Source: Dírección General de Estadística y Censos Nacionales, Ministerio de Fomento, Boletin de Comercio Exterior 1969 and 1970, Venezuela. Memoria, Ministerio de Minas e Hidrocarburos, Caracas, Venezuela, March 1969 and 70.

Table 3.—Venezuela: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum:			
Oxide (alumina) and hydroxide	33,971	45,285	United States 38,792; Jamaica 6,348; France 74.
Metal:			
Unwrought	21	10	United Kingdom 10.
Semimanufactures	6,120	2,763	United States 1,372; West Germany 324; Switzerland 277.
Antimony metal, including alloys, all forms	64	141	United States 121; Belgium-Luxembourg 15; Mexico 3.
Arsenic, trioxide, and pentoxide	34	54	West Germany 27; France 11; Belgium-Luxembourg 9.
Chromite	4,756	3,866	Philippines 3,861; United States 5.
Copper:			
Copper sulfate	99	38	United Kingdom 7; United States 7; West Germany 6.
Metal including alloys:			
Scrap	50	219	All from Colombia.
Unwrought	213	118	United States 56; Belgium-Luxembourg 50; Canada 9.
Semimanufactures	6,626	6,611	Chile 2,905; United States 1,339; Canada 1,040.
Gold, metal, worked or partly worked troy ounces	4,180	11,253	United States 9,002; West Germany 1,157; Canada 675.
Iron and steel:			
Ore and concentrate	4	24	United States 22; West Germany 2.
Metals:			
Scrap	47,854	151,585	United States 145,173; Trinidad and Tobago 3,224; Guyana 1,666.
Pig iron, ferroalloys and similar materials	7,673	10,353	Brazil 4,769; United States 3,534; Norway 1,620.
Steel primary forms, ingots	6,549	6,467	West Germany 1,472; United Kingdom 1,352; United States 1,240.
Semimanufactures:			
Bars, rods, sections	39,665	30,825	Belgium-Luxembourg 11,577; West Germany 5,340; Japan 5,033; United States 4,369.
Universals, plates, and sheets:			
Medium plates and sheets, uncoated	251,325	293,582	Japan 224,598; United States 31,438; Brazil 11,072; West Germany 9,415.
Other coated plates and sheets	79,672	97,003	Japan 32,169; France 28,421; Netherlands 11,150.
Other	20,270	25,423	Japan 19,579; United States 4,440; West Germany 385.
Hoop and strip	5,228	3,310	Japan 931; United Kingdom 673; United States 444; West Germany 382.
Rails and accessories	2,094	1,131	United States 975; Italy 135; Switzerland 14.
Wire	31,390	28,333	Belgium-Luxembourg 12,185; Japan 11,496; United Kingdom 1,803.
Tubes, pipes, and fittings	[r] 93,272	77,105	Japan 24,619; United States 22,347; Argentina 7,521; West Germany 6,067.
Other	1,102	1,274	United States 830; West Germany 180; Japan 81.
Lead metal, including alloys, all forms	2,721	3,153	Mexico 979; United States 558; Peru 375.
Mercury 76-pound flasks	50	189	Mexico 112; United States 50; West Germany 12.
Nickel metal, including alloys, all forms	55	70	United States 30; United Kingdom 19; Canada 9.
Platinum-group metals including alloys, all forms, platinum troy ounces	4,726	1,640	West Germany 1,125; Italy 450; Switzerland 64.
Silver metal, including alloys do	162,393	189,368	United States 94,137; West Germany 77,322; United Kingdom 11,124.
Tin metal, including alloys, all forms long tons	147	167	United States 50; United Kingdom 50; West Germany 25.
Titanium oxide	[r] 5,131	5,759	United Kingdom 1,531; United States 1,379; West Germany 923.
Zinc metal, including alloys:			
Unwrought	6,265	7,713	Canada 4,367; Mexico 2,572; Japan 402.
Semimanufactures	692	1,280	United States 478; Mexico 367; Canada 111.
Other:			
Ore and concentrates	151	267	United States 264; United Kingdom 2; West Germany 1.
Ash and residue containing nonferrous metals	[r] 1	218	United States 204.
Metals, including alloys, all forms	224	76	United States 59; Canada 6; Belgium-Luxembourg 4.

See footnotes at end of table.

Table 3.—Venezuela: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
NONMETALS			
Abrasives, natural n.e.s	429	473	West Germany 291; Austria 77; Italy 68.
Asbestos	4,673	6,662	Canada 4,408; Republic of South Africa 2,063; Chile 183.
Barite	12,610	20,656	Brazil 12,196; Canada 4,997; Ireland 3,454.
Boron materials: Crude natural borates	1,089	1,149	Belgium-Luxembourg 446; United Kingdom 254; United States 228.
Cement	r 1,002	1,006	West Germany 500; United States 325; France 172.
Clays and products (including all refractory brick) crude n.e.s.:			
Bentonite	6,843	14,411	United States 14,374; France 15.
Kaolin (china)	9,104	12,668	United States 7,742; United Kingdom 4,711; West Germany 152.
Other	16,563	15,816	United States 8,722; Guyana 4,600; United Kingdom 1,268.
Cryolite and chiolite	552	871	United States 866; West Germany 5.
Diamond, industrial..thousand carats	155	65	All to the United States.
Diatomite and other infusorial earths	3,382	2,646	United States 1,579; Mexico 940; West Germany 64.
Feldspar	1,841	2,201	United States 2,135; Canada 62.
Fertilizer materials, crude and manufactured:			
Nitrogenous	18,823	68,568	West Germany 49,151; Belgium-Luxembourg 14,360; Netherlands 5,056.
Phosphatic	r --	14,234	United States 9,556; Romania 4,678.
Potassic	r 19,240	26,918	Spain 12,850; France 7,006; United States 5,589.
Mixed	13	31,090	Belgium-Luxembourg 18,235; Italy 11,135; Dominican Republic 1,700.
Fluorspar	57	1,685	Mexico 1,456; Spain 30; United States 23.
Graphite, natural	153	102	United States 80; United Kingdom 22.
Gypsum and plasters	269	208	West Germany 94; United States 81; United Kingdom 33.
Magnesite	3,688	1,375	Japan 1,094; Netherlands 218; Austria 63.
Mica, all forms	202	340	United States 339.
Salt	30	32	United States 29; West Germany 3.
Sodium and potassium compounds	62,962	63,642	United States 58,826; United Kingdom 2,468; France 2,111.
Stone, sand and gravel:			
Dimension stone	5,019	4,021	Italy 2,138; Norway 875; Portugal 608.
Crushed rock	54,322	46,365	United States 46,313; Belgium-Luxembourg 51.
Sand and gravel	1,858	3,530	United States 3,443; Austria 49.
Sulfur [1]	11,598	26,052	Poland 25,215; Belgium-Luxembourg 457; United States 208.
Talc, steatite	4,421	10,120	United States 6,593; Italy 2,200; People's Republic of China 445.
Other nonmetals, n.e.s.:			
Earth colors, etc	386	425	United States 334; Mexico 1.
Vermiculite	--	16	All from West Germany.
Mineral substances, n.e.s	--	1,040	United States 539; Canada 328; Mexico 107.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	89	195	United States 165; West Germany 30.
Carbon black	1,193	553	United States 341; Japan 109; Canada 66.
Coal and fuel briquets, all grades	r 27,190	28,761	United Kingdom 13,127; United States 12,017; West Germany 3,589.
Coke and semicoke	276,679	314,543	United States 289,748; West Germany 13,965; Colombia 6,391.
Gas, hydrocarbon, natural gas liquids:			
Natural gasoline..42-gallon barrels	535	--	
Natural gas liquids thousand 42-gallon barrels	r 93	209	France 151; Sweden 23; Japan 12.
Petroleum:			
Refinery products:			
Gasoline..do	47	318	Netherlands Antilles 220; United States 50; Netherlands 35.
Kerosine..do	(2)	(2)	
Lubricants..do	39	35	United States 26; Netherlands 5; United Kingdom 3.
Paraffin wax and petroleum do	r 11	13	United States 11; United Kingdom 1; West Germany 1.
Other..do	r 119	388	United States 369; United Kingdom 12; Netherlands 5.
Mineral tar and other coal- petroleum- or gas-derived crude chemicals	311	499	United States 443; Denmark 43; West Germany 10.

r Revised.

[1] Mostly refined.

[2] Less than ½ unit.

Source: Dírección General de Estadística y Censos Nacionales, Ministerio de Fomento, Boletin de Comercio Exterior, 1969 and 1970, Venezuela.

COMMODITY REVIEW

METALS

Aluminum.—Plans were announced during August 1971 to increase the production capacity of Venezuela's only aluminum reduction plant from 25,000 to 50,000 tons per year. This plant, located at Matanzas just outside of Puerto Ordaz, is operated by Aluminio del Caroni, S.A. (ALCASA), a joint venture of Reynolds Metals Co. and Corporación Venezolana de Guayana (C.V.G.), a Venezuelan Government entity.

Gold.—Preparatory work for the rehabilitation of the El Callao mines in the State of Bólivar was initiated during December 1971. These workings were once the site of large-scale gold mining before rising costs resulted in the decline of operations during the late 1940's and the cessation of all significant activity in the early 1950's. The renewed development of the mines is to be carried out by Compañia General de Minería de Venezuela, C.A. (MINERVEN), a joint-venture company in which the Government and foreign private investors (probably United Kingdom) each are to have a 40 percent interest and private local investors are to hold a 20 percent share.

Iron and Steel.—Venezuela's iron ore production declined 7 percent from the previous year's record high during 1971. This decrease occurred mainly as a result of labor problems at midyear and the decline in world demand for iron ore.

Almost all of the country's output was accounted for by the Orinoco Mining Co., a subsidiary of the United States Steel Corp., which produced 17.0 million tons, and Iron Mines Co. of Venezuela, a subsidiary of Bethlehem Steel Corp., which produced 2.9 million tons. The remaining 600,000 tons of 1971 output was produced in conjunction with evaluation activities at the San Isidro deposits near Ciudad Piar. Most of the iron ore produced was exported with 68 percent of these shipments going to the United States. All domestic consumption was accounted for by Siderúrgica del Orinoco, S.A., (SIDOR), a subsidiary of the Government-owned C.V.G. which obtained the bulk of its ore supply from the San Isidro deposits.

Construction of Orinoco Mining's 1-million-ton-per-year iron ore briquetting plant was essentially completed at yearend. This plant, located at Puerto Ordaz, will use a natural gas reduction process to upgrade ore to 86.5 percent iron content. Full-scale production was expected to begin, after several trial runs, by mid-1972.

During 1971, the Ministerio de Minas e Hidrocarburos was in the process of evaluating data collected with respect to the projected development of the San Isidro iron ore deposits. Plans being considered included the construction of a 2.5-million-ton-per-year pelletizing plant adjacent to the mine. Indications were, that upon completion of its study of the data collected, the Ministerio would call for State-private company joint venture bids for exploitation of the San Isidro deposits.

In May 1971 Orinoco Mining Co. announced a program to expand its iron ore export capability by almost 50 percent. This program will involve the installation of additional crushing facilities and a drying and screening plant in Puerto Ordaz as well as the accelerated development of the Altimara-Rondon concessions near the company's Cerro Bolivar mine. The new plant at Puerto Ordaz will have equipment for crushing ore to 1¼ inches in three steps and will utilize two natural gas-fired rotary dryers to reduce the moisture in the ore by about 5 percent. Accelerated development of the Cerro Altamira and Cerro Redondo sites will require the purchase and installation of additional mining equipment, the laying of 25 kilometers of railroad track, and the construction of a 5-kilometer access road.

Venezuela's output of pig iron was produced exclusively by SIDOR. This company also accounted for the bulk of the country's production of crude steel although its operations were hampered by an employees strike at midyear. The country's only other producer of crude steel was Siderúrgica Venezolana, S.A. (SIVENSA), a private company.

Work continued on SIDOR's expansion program to increase its basic steel output capacity to 3 million tons per year and to expand the variety of its products. Modification of the Siemens-Martin open-hearth furnaces was in progress, and the construction of a new oxygen plant and two soaking pits probably was nearing completion at yearend. Construction of a flat products plant and the installation of an electrolytic tinning line were initiated.

Nickel.—During the latter part of 1971, the Ministerio de Minas e Hidrocarburos announced that the nickel deposits at Loma de Hierro in the States of Aragua and Miranda would be exploited by a mixed Government-private industry entity. The Government will have a 51 percent interest in this entity and the remaining 49 percent will be held by Société Le Nickel of France. Reserves at Loma de Hierro have been estimated at 38 million metric tons (dry) of laterite and serpentine ores with an average nickel content of 1.5 to 1.6 percent.

NONMETALS

Cement.—Early in 1971 the International Finance Corp. of the World Bank group authorized the purchase of up to $2 million [2] of a new $5.6 million-issue of mortgage bonds of Consolidada de Cementos, C.A. (Conceca). Funds from the bond issue are to be used to meet the company's long-term capital requirements following the recent completion of its 400,000-ton-per-year San Sebastian plant.

Conceca's share of the Venezuelan cement market has averaged about 16 percent during the past few years. The company supplies the States Aragua, Carabobo, and Falcón and also exports small quantities.

Fertilizer Materials.—Construction was in progress during 1971 on a new 600-ton-per-day ammonia plant and a 750-ton-per-day urea plant at the Morón petrochemicals complex of the Instituto Venezolano de Petroquimica (I.V.P.). Work was also in progress at Morón on facilities for the production of phosphoric acid and triple superphosphate in powder and granular form. The phosphatic rock feedstock for these I.V.P. facilities will be obtained from the Riecito phosphate mine in the State of Falcón where operations are being modernized and expanded.

Port facilities and the first stage power and steam-generating facilities were nearing completion and other civil works construction was in progress at the new El Tablazo petrochemicals complex during 1971. Work was also progressing on the petrochemical fertilizer plant of Venezolana de Nitrógen (NITROVEN), a joint-venture firm owned 50 percent by I.V.P.; 40 percent by International Development and Investment, a U.S. and European consortium; and 10 percent by Petroquímica Atlantico of Colombia. This plant is to have the capacity to produce 660,000 tons of ammonia and 800,000 tons of urea per year. Completion was scheduled for the latter part of 1972.

MINERAL FUELS

Coal.—Coal production increased approximately 3 percent during 1971 to a level only 2 percent below the peak output of approximately 42,000 tons recorded in 1963.

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[2] Where necessary, values have been converted from Bolivares (Bs) to U.S. dollars at the rate of Bs 4.485=U.S.$1.00.

Table 4.—Venezuela: Salient satistics of the petroleum and natural gas industry

	1969	1970	1971 p
Crude oil:			
Production thousand 42-gallon barrels	1,311,832	1,353,420	1,295,406
Processed at refineries do	421,783	471,709	454,799
Exports [1] do	903,728	888,637	844,575
Natural gas:			
Production million cubic feet	1,673,013	1,710,200	1,680,252
Sales do	130,736	136,528	134,480
Producers' fuel do	151,078	180,989	196,281
Shrinkage due to extraction of natural gas liquids do	32,278	31,113	37,469
Field injection do	752,845	710,220	741,121
Flared or otherwise lost do	606,076	651,350	570,901
Natural gas liquids:			
Production thousand 42-gallon barrels	13,820	16,922	24,000
Exports do	7,771	10,413	17,049
Refinery products:			
Refinery output [2] do	422,067	470,864	452,536
Consumption do	51,354	54,105	57,282
International bunkers do	18,859	19,036	18,870
Exports do	341,209	377,769	361,326

p Preliminary.
[1] Includes refined or partly refined products blended with crude oil.
[2] Includes refinery fuel.

Source: Ministerio de Minas e Hidrocarburos. Memoria y Cuenta, Año 1969, 1970, 1971. Caracas, Venezuela, March 1970, March 1971, and March 1972.

All production in 1971 was from the State of Táchira, and almost three-fourths of the total was accounted for by one company, C. A. Minas de Carbón de Lobatero.

In mid-1971, agreement was reached on a project to reopen the Naricual coal mines. The project is to be carried out by a mixed-venture organization comprised of the Ministerio de Minas and a consortium of United Kingdom and Venezuelan private firms. Plans call for development of the mines' output capacity to at least 500,000 tons annually, primarily by the installation of mechanized mining equipment. A coking plant with a minimum capacity of 360,000 tons per year is also to be constructed. The output of this plant would be used primarily to supply the coke requirements of SIDOR's iron and steel mill at Ciudad Guayana.

At yearend 1971, the Ministerio de Minas announced plans for the exploration of the Zulia Carboniferous Basin. This basin, which is approximately 43 kilometers long and from 1 to 3 kilometers wide, is located primarily in the Mara District of the State of Zulia. The exploration program is to include (1) a general geologic survey of the basin; (2) a detailed topographic survey of the streams where carboniferous outcrops are found; (3) a geologic study of each outcropping carboniferous mantle, including detailed profiles, measurements of strike and dip, thicknesses, and petrographic studies of samples; (4) correlation study of the coal mantles; (5) sampling of the carboniferous beds to determine their chemical and physical characteristics; (6) selection of the most promising areas for economic extraction.

Petroleum and Natural Gas.—Venezuela's output of crude oil declined 4 percent to 3,549,000 barrels per day during 1971. Medium crudes (22.1° to 30° API) accounted for approximately 38 percent of total production; light crudes (over 30° API) 36 percent; and heavy crudes (under 22.1° API) 26 percent. Companies owned by U.S. firms produced almost 72 percent of the total with Creole Petroleum Corp., a subsidiary of Standard Oil Co. (New Jersey), alone accounting for 43 percent.

Natural gas production, over 98 percent of which was from oilfields, declined almost 2 percent to 4,603 million cubic feet per day in 1971. The output of natural gas liquids rose 42 percent to 66,000 barrels per day in conjunction with a large increase in the capacity of the natural gas processing facilities in the Lake Maracaibo area.

Proved reserves of crude oil declined for the sixth consecutive year, decreasing 302 million barrels to a reported total of 13,737 million barrels at yearend 1971. Natural gas reserves, as of the same date, totaled 31,625 billion cubic feet, 34 billion cubic feet less than the revised 1970 yearend figure. Almost 93 percent of total proved gas reserves at the end of 1971 was accounted for by dissolved and associated gas; only 7 percent was nonassociated.

Geologic and geophysical exploration, and exploratory development and injection drilling activities were as follows:

		1969	1970	1971
Geologic and geophysical exploration:				
Geologic surveying	party months	3.5	6.7	--
Gravimetric surveying	do	.7	.4	--
Magnetic surveying	do	.7	.4	0.3
Seismic surveying	do	12.9	11.7	23.3
Structural drilling	do	11.3	11.9	9.7
Total	do	29.1	31.1	33.3
Drilling:				
Wells drilled:				
Exploratory:				
Oil	number	69	64	137
Dry	do	33	38	29
Subtotal	do	102	102	166
Development:				
Oil	do	375	513	424
Dry	do	12	5	12
Subtotal	do	387	518	436
Injection	do	11	12	2
Total	do	500	632	604
Footage drilled	thousand feet	3,188	3,063	2,955

Source: Ministerio de Minas e Hidrocarburos. Memoria y Cuenta, Año 1969, 1970, 1971. Caracas, Venezuela, March 1970, March 1971, and March 1972.

C.V.P., the Government oil company, continued its exploratory activity in the Orinoco heavy oil belt. Included in these activities were a seismic reflection survey and several stratigraphic tests in the eastern part of the area. Results of these studies are to be used to determine future well locations. C.V.P. has indicated that a conventional exploration program might lead to discoveries that could be exploited in the near future, although it has not discounted the possibility that results of the exploration program might reveal the need for pilot test production operations. A need for such tests could delay the advent of large-scale production from the heavy oil belt until the 1980's.

During October 1971, C.V.P. requested bids for a seismic survey covering a section of the Continental Shelf located east of Margarita Island and north of the eastern part of the State of Sucre. This survey will involve a study of approximately 7,700 kilometers of seismic lines.

Service contracts covering approximately 250,000 hectares assigned to C.V.P. in the Southern part of Lake Maracaibo were signed with three private companies during 1971. Contracts involving three of the five 50,000-hectare blocks into which the area was divided for bidding purposes were signed with the Occidental Petroleum Corp. Agreements covering one block each were signed with Shell Sur del Lago, C.A. (Surco) and Mobil de Maracaibo. These service contracts call for the initiation of seismic surveying within 60 days and for the drilling of a specified minimum number of exploratory wells within 3 years. Each contractor payed a signature bonus and agreed to the payment of specified production bonuses. All petroleum discovered will legally be the property of C.V.P. who will, in effect, return 90 percent of production to the contractor and pay the production costs of the 10 percent retained. C.V.P. also has contractual rights to varying percentages of participation in the contractors' operations. Contractors will be required to pay royalties and the Venezuelan petroleum income tax on their 90 percent share of production.

The capacity of natural gas injection facilities was increased 185 million cubic feet daily to a total of 3,850 million cubic feet in 1971. Gas injection during the year was at an average rate of 2,080 cubic feet daily. Water injection capacity was raised 447,000 barrels per day to a total of 2,371,000 barrels daily by yearend 1971, and the average injection rate during the year was 1,625,000 barrels per day.

Refinery output averaged 1,240,000 barrels per day during 1971, down almost 4 percent from the previous year. This decline occurred in conjunction with a decrease in refined products exported. Venezuela's refineries processed approximately 35 percent of the country's crude oil output in 1971, the same as in the previous year.

Construction was in progress during 1971 on a fifth atmospheric distillation unit at the Amuay refinery of Creole Petroleum Corp. The addition of this unit will increase the refinery's throughput capacity by about 40 percent to 630,000 barrels per day. Completion of this project was scheduled for 1972.

An 88,000-barrel-per-day vacuum distillation unit was also under construction at Amuay in 1971. In addition, plans were announced for the expansion of the plant's digital control and desulfurization facilities. The installation of additional automation equipment for production and blending operations is expected to improve refined product quality control. Desulfurization facilities are to be expanded to permit the output of an additional 30,000 barrels per day of residual fuel oil with a sulfur content of 1 percent.

The total length of crude oil and natural gas pipelines in service increased 57 and 116 kilometers, respectively, during 1971, but the length of refined product lines remained the same. Data on the length of pipelines in operation at yearend 1971 were as follows:

Type of line	Total length (kilometers)
Crude oil:	
Trunk	3,359
Secondary	2,733
Subtotal	6,092
Refined products	512
Natural gas	2,900
Total	9,504

Source: Ministerio de Minas e Hidrocarburos. Memoria y Cuenta, Año 1971. Caracas, Venezuela, March 1972.

Most of the addition to total natural gas pipeline length was accounted for by the completion of a network of new lines in the Lake Maracaibo area. This network was built primarily to serve the petrochemicals complex under construction at El Tablazo. This pipeline project was undertaken by C.V.P. both by itself and in partnership with Cia. Shell de Venezuela, Ltd.

A total of 17 petroleum tanker terminals were active in the exportation of crude oil and refined products during 1971. Of these, the three operated by Creole Petroleum Corp. accounted for 41 percent of all shipments and the four operated by Cia. Shell de Venezuela, Ltd., loaded 31 percent of the total.

Several petrochemical projects in addition to those summarized previously under "Fertilizer Materials" were under construction or in the planning stage during 1971. A program to expand the capacity of the 3,000-metric-ton-per-year phthalic anhydride plant at Valencia to 10,000 tons per year was in progress. This plant is operated by Oxidaciones Organica which is owned by the Montana Group, comprised of Venezuelan investors; Sherwin-Williams Co.; and I.V.P.

During 1971 I.V.P. signed contracts for the design, engineering, and construction of olefins and chlorosoda plants at the El Tablazo petrochemicals complex. The contract covering the olefins plant was signed with M. W. Kellog Co. and that for the chlorosoda plant was awarded to Oronzio de Nora of Italy. The latter plant is to have a capacity of 35,000 tons of chlorine and 39,200 tons of caustic soda per year. Both plants are scheduled for completion during the last half of 1972.

Several other petrochemical plants to be located at El Tablazo were in the planning stage at yearend 1971. Details were being negotiated for the construction of a plant for the annual production of 50,000 tons of vinyl chloride monomer and 30,000 tons of polyvinyl chloride. This installation would be operated by Plásticos Petroquímica, C.A., a joint venture involving I.V.P.; Grupo Zuliano, which is comprised of local investors; and B. F. Goodrich Co. Other joint ventures under consideration for El Tablazo were the 15,000-ton-per-year polystyrene plant of Estireno del Zulia (I.V.P., Dart Industries of the United States, and unspecified local investors) and the 50,000-ton-per-year, low-density polyethylene plant of Polimeros del Lago (I.V.P., Grupo Zuliano, and Ethylene Plastique of France).

Table 5.—Venezuela: Distribution of landholdings, crude oil production, and refining capacity, by company, 1971

Company	Principal ownership or affiliation	Nationality of ownership	Concessions [1] and assignations [2] as of Dec. 31, 1971 (hectares)	Crude oil production (thousand 42-gallon barrels)	Refining capacity as of Dec. 31, 1971 (thousand 42-gallon barrels daily)
PRIVATE					
Amoco Venezuelan Oil Co.	Standard Oil Co. (Indiana).	United States	5,500	8,387	--
Caracas Petroleum, S.A.	Ultramar Co., Ltd.	British	29,883	1,876	--
Charter Venezuelan Petroleum Co.	Charter Oil Co.	United States	7,000	3,349	--
Chevron Oil Co. de Venezuela, S.A.	Standard Oil Co. of Calf.	do.	87,020	20,161	62
Cía. Shell de Venezuela, Ltd.	Royal Dutch/Shell Group.	British/ Dutch.	295,680	340,943	404
Cía. Española de Petróleos, S.A.	Cía. Española de Petróleos, S.A.	Spanish	10,546	--	--
Continental Oil Co. of Venezuela.	Continental Oil Co.	United States	797	2,269	--
Coro Petroleum Co.	Texaco, Inc.	do.	70,865	2,785	--
Creole Petroleum Corp.	Standard Oil Co. (New Jersey).	do.	580,262	553,736	550
International Petroleum (Venezuela), Ltd.	do.	do.	6,133	--	--
King Mill Oil Co., C.A.	King Mill Oil Co.	do.	4,970	--	--
Mene Grande Oil Co., C.A.	Gulf Oil Corp.	do.	593,748	151,159	--
Mito Juan Concesionaria de Hidrocaruros, C.A.	Venezuelan investors	Venezuelan	33,775	1,336	--
Mobil Oil de Venezuela	Mobil Oil Corp.	United States	144,054	38,102	106
Phillips Petroleum Co.	Phillips Petroleum Co.	do.	39,447	14,863	4
Sinclair Venezuelan Oil Co.	Atlantic Richfield Co. Co.	do.	39,082	14,358	45
Sociedad Anónima Petrolera Las Mercedes.	Texaco, Inc., and Ultramar Co., Ltd.	United States/ British.	63,026	629	--
Talón Petroleum Co., C.A.	Kirby Petroleum Co.	United States	60,167	966	--
Texaco Maracaibo, Inc.	Texaco, Inc.	do.	3,147	20,055	--
Texas Petroleum Co.	do.	do.	124,328	19,623	10
Venezuelan American Independent Oil Producers Association, Inc.	Atlantic Richfield Co., Sun Oil Co., Texaco, Inc.	do.	841	--	--
Venezuelan Atlantic Refining Co.	Atlantic Richfield Co.	do.	21,151	--	--
Venezuelan Guld Refining Co.	Gulf Oil Corp.	do.	--	--	159
Venezuelan Sun Oil Co.	Sun Oil Co.	do.	20,000	80,422	--
Total private companies			2,241,422	1,275,019	1,340
VENEZUELAN GOVERNMENT					
Corporación Venezolana de Petróleo (C.V.P.)			900,057	20,387	25
Grand Total			3,141,479	1,295,406	1,365

[1] To private companies.
[2] To the Government.

Source: Ministerio de Minas e Hidrocarburos, Venezuela. Memoria y Cuenta, Año 1971, Caracas, Venezuela, March 1972.

The Mineral Industry of Yugoslavia

By Roman V. Sondermayer [1]

During 1971 Yugoslavia produced a large variety of minerals and mineral products and remained one of the leading European producers of nonferrous metals. The country's crude oil output was minor by world standards. However, Yugoslavia ranked fourth after the U.S.S.R., Romania, and the Federal Republic of Germany in European crude oil production in 1971. Antimony, bauxite, copper, lead-zinc ores, and nonmetallics such as barite, feldspar, magnesite, and pyrites were among the more important minerals and mineral products produced. Iron and steel output continued to be inadequate to cover demand. Consequently imports of large quantities of iron and steel semimanufactures were required. Although crude oil and coal production increased in 1971, the output of mineral fuels continued to fall short of domestic requirements, necessitating imports of both high–rank coal and petroleum. The power shortages adversely influenced mineral production during 1971 as in past years.

Major activities in the mineral industry included the beginning of trial production of aluminum metal at the Titograd aluminum plant, continuation of construction of an aluminum plant at Šibenik and alumina plant near Mostar, beginning of pig iron production at the Smederevo iron and steel plant, continuation of construction of a lead and zinc smelter at Titov Veles, cessation of offshore drilling near the island of Dugi Otok in the Adriatic where four dry wells were drilled in late 1970 and early 1971, and planning for a large open pit lignite mine at Tamnava in the Kolubara coal basin west of Belgrade.

The foreign trade balance in minerals, including mineral fuels, remained negative mostly because of imports of fuels and steel semimanufactured products. The shortage of capital for investment persisted; however, the law relating to foreign capital investment was modified, making reinvestments more attractive.

PRODUCTION

Mineral producers continued to direct their efforts toward better utilization of existing facilities rather than construction of new plants. Although investments in expanding and renovating processing facilities were predominant, a shift in channeling available capital toward mine expansion was apparent. The shortages of ores and concentrates forced the change. Mechanization and automation in both mining and processing continued during 1971, but most of the modern equipment was installed at new mines.

Productivity per man-shift of Yugoslav miners remained lower than the average productivity of miners in Western Europe. Labor shortages continued in mines as the Yugoslav Government mildly encouraged the expatriation of surplus workers.

Modern and efficient methods prevailed in petroleum exploration, production, and refining. With the drilling of four offshore wells by a French drilling contractor, the industry gained some experience in offshore activities. All three primary methods of oil flowing, pumping, and gas lifting were used; dual completion was used at some wells in the country; and secondary recovery was employed at some older fields. Chemical and hydraulic methods for stimulating gas and oil production were everyday practice in the oilfields of Yugoslavia during 1971.

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[1] Petroleum engineer, Division of Fossil Fuels.

Table 1.—Yugoslavia: Production of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971 ^{p}
METALS			
Aluminum:			
Bauxite, gross weight .... thousand tons	2,128	2,099	1,959
Alumina, gross weight	121,568	125,129	^{e} 125,000
Ingot including secondary	48,248	47,738	46,584
Antimony:			
Mine output, metal content	2,067	2,900	2,600
Metal (regulus)	2,037	1,967	1,381
Bismuth, smelter [2]	102	75	92
Cadmium, smelter [2]	170	^{e} 150	^{e} 160
Chromium, chromite, gross weight	39,434	40,565	34,319
Copper:			
Mine output, metal content	81,676	90,808	94,410
Blister:			
Primary	92,619	105,901	103,230
Secondary	3,304	1,902	^{e} 1,800
Refined (electrolytic):			
Primary	78,326	86,837	90,501
Secondary	3,677	2,450	2,075
Gold [3] .... troy ounces	84,074	97,384	^{e} 98,000
Iron and steel:			
Iron ore and concentrate .... thousand tons	2,721	3,694	3,725
Pig iron .... do	1,198	1,275	1,514
Ferroalloys, all types .... do	90	102	116
Crude steel .... do	2,220	2,228	2,672
Semimanufactures .... do	1,570	1,774	1,865
Lead:			
Mine output, metal content	118,045	126,693	125,220
Metal:			
Smelter, crude, including secondary	123,512	112,232	^{e} 115,000
Refined including secondary	106,956	97,399	99,139
Manganese ore and concentrate, gross weight	12,331	14,785	16,113
Mercury .... 76-pound flasks	14,330	15,461	16,564
Selenium, elemental .... kilograms	8,866	16,000	^{e} 15,000
Silver, refined, including secondary [2] .... thousand troy ounces	3,818	3,417	3,354
Zinc:			
Mine output, metal content	96,728	101,145	100,200
Smelter including secondary	81,059	65,023	53,110
NONMETALS			
Asbestos	11,461	12,104	15,432
Barite	81,511	79,729	^{e} 80,000
Cement, hydraulic .... thousand tons	3,964	4,399	4,954
Clays, fire:			
Crude	259,529	292,070	NA
Burned	71,671	88,370	NA
Feldspar, crude	44,982	49,504	^{e} 50,000
Fertilizer materials manufactured:			
Nitrogenous:			
Gross weight .... thousand tons	917	1,332	827
Nitrogen content .... do	183	266	NA
Phosphatic:			
Gross weight .... do	872	1,294	647
Phosphorus pentoxide content .... do	143	214	NA
Gypsum:			
Crude	231,829	250,619	^{e} 270,000
Calcined	63,069	66,010	NA
Lime:			
Quicklime .... thousand tons	1,030	1,078	^{e} 1,100
Hydrated .... do	366	430	^{e} 450
Magnesite:			
Crude	477,417	511,854	^{e} 493,000
Sintered	193,160	210,309	NA
Caustic, calcined	14,410	10,135	NA
Mica, all grades .... kilograms	135,565	227,468	^{e} 230,000
Pyrite:			
Gross weight	272,422	355,000	276,000
Sulfur content ^{e}	114,417	149,000	116,000
Quartz, quartzite and glass sand .... thousand tons	812	983	NA
Salt:			
Marine	17,696	23,510	NA
Evaporated	127,887	101,668	NA
Other	66,417	84,625	NA
Total	212,000	209,803	^{e} 209,000

See footnotes at end of table.

Table 1.—Yugoslavia: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971[p]
NONMETALS—Continued			
Stone, sand and gravel, n.e.s.:			
Dimension:			
Crude:			
Ornamental thousand cubic meters	36	39	NA
Other do	19	8	NA
Partly worked facing stone thousand square meters	427	485	529
Cobblestones, curbstones, and other thousand cubic meters	64	51	NA
Crushed and broken do	5,564	6,067	NA
Milled marble and other do	1,410	1,862	NA
Sand and gravel do	7,163	7,713	NA
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	15,531	13,469	[e]14,000
Coal:			
Bituminous thousand tons	682	643	707
Brown do	9,442	8,989	9,338
Lignite do	16,373	18,790	20,862
Total do	26,497	28,422	30,902
Coke:			
Metallurgical do	1,165	1,226	NA
Breeze do	61	83	NA
Total do	1,226	1,309	1,297
Fuel briquets, all grades	36,450	21,312	NA
Gas:			
Manufactured (city gas only) million cubic feet	3,044	[e]3,100	NA
Natural, gross production do	25,784	34,502	40,634
Natural gas liquids thousand 42-gallon barrels	806	NA	NA
Petroleum:			
Crude oil:			
As reported thousand tons	2,699	2,854	2,961
Converted[e] thousand 42-gallon barrels	19,991	21,140	21,932
Refinery products:			
Gasoline do	8,526	10,481	12,512
Jet fuel do	[r]492	588	1,664
Kerosine do	[r]601	696	
Distillate fuel oil do	[r]12,854	15,606	19,881
Residual fuel oil do	[r]13,107	16,710	19,541
Lubricants do	[r]619	719	799
Asphalt and bitumen including natural do	1,902	2,168	2,279
Refinery fuel and losses do	1,148	1,896	NA
Other do	[r]158	426	NA
Total do	39,407	49,290	NA

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, germanium, clays (bentonite and kaolin), diatomite, and additional petroleum products (most notably petroleum coke), are also produced, but information available is inadequate to make reliable estimates of production levels.

[2] All as a byproduct of lead and zinc production.

[3] Mainly as a byproduct of copper production.

TRADE

During 1970, the latest year for which data are available, Yugoslavia's mineral trade was diversified and many commodities were exported to and imported from a large number of countries. Exports consisted mostly of nonferrous metals and related products. West Germany was again the principal purchaser of Yugoslav products. However, imports included bituminous coal, crude oil, and iron and steel semimanufactured products, and the largest source of minerals imports remained the U.S.S.R.

Table 2.—Yugoslavia: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum:			
Bauxite thousand tons	1,983	2,032	U.S.S.R. 791; West Germany 600; Italy 319; Romania 159; Czechoslovakia 87.
Oxide and hydroxide	23,703	28,198	Austria 21,056; West Germany 7,113.
Metal including alloys:			
Scrap	[r] 5,490	3,785	Italy 2,698; West Germany 732.
Unwrought	[r] 25,118	15,780	Italy 10,399; Austria 1,939; Colombia 1,727.
Semimanufactures	[r] 26,579	25,086	United States 5,206; Bulgaria 3,995; Poland 3,005; West Germany 2,874; Sweden 2,624.
Antimony regulus	1,266	1,259	West Germany 369; Poland 260; Italy 220; United Kingdom 175.
Arsenic, trioxide	597	222	Pakistan 139; India 61.
Bismuth including alloys, all forms	55	47	Netherlands 32; Italy 15.
Cadmium including alloys, all forms	130	55	Netherlands 27; Italy 19; United Kingdom 8.
Chromium, chromite concentrates	3,203	11,327	Czechoslovakia 10,468; East Germany 712; U.S.S.R. 147.
Copper including alloys:			
Scrap	519	422	All to Italy.
Unwrought	17,519	27,812	United Kingdom 17,540; France 9,200.
Semimanufactures	45,733	48,052	United Kingdom 8,465; West Germany 7,335; Italy 5,402; United States 5,104.
Iron and steel:			
Ores and concentrates except roasted pyrites	153,747	178,964	Romania 178,554.
Roasted pyrite	1,192	84	All to Austria.
Scrap	14,632	23,016	Italy 15,178; West Germany 6,402.
Pig iron, ferroalloys, and similar materials	46,921	48,064	West Germany 11,151; Italy 9,904; United States 9,303.
Steel, primary forms	36,105	15,194	Italy 8,854; Hungary 5,161.
Semimanufactures:			
Bars, rods, angles, shapes, sections	94,613	115,341	U.S.S.R. 31,504; mainland China 21,973; West Germany 14,512; Italy 14,058.
Universals, plates, and sheets	49,167	59,819	Italy 26,278; West Germany 11,788; Greece 8,171.
Hoop and strip	8,806	12,401	Italy 6,422; Switzerland 3,064; Greece 1,958.
Rails and accessories	23,570	32,913	Romania 23,499; Bulgaria 8,099.
Wire, (excluding wire rods)	2,358	4,444	Italy 2,322, Hungary 1,261.
Tubes, pipes, and fittings	69,476	82,851	East Germany 22,361; Italy 10,779.
Castings and forgings, rough	9,090	12,342	Poland 4,930; West Germany 3,060; Italy 1,185; Austria 1,005.
Total	257,080	320,111	
Lead:			
Ores and concentrates	25,812	11,833	Romania 5,738; Greece 5,729; United Kingdom 365.
Oxides	1,327	640	Italy 238; West Germany 205; Hungary 175.
Metal including alloys:			
Unwrought	67,261	56,086	United States 16,795; U.S.S.R. 15,978; Austria 10,219; Poland 6,505.
Semimanufactures	1,797	718	Italy 337; Kuwait 143; Austria 86.
Magnesium including alloys, all forms	25	--	
Manganese:			
Ore and concentrates	194	--	
Metal	25	--	
Mercury 76-pound flasks	14,775	13,930	United States 4,729; U.S.S.R. 2,610; West Germany 2,075; United Kingdom 1,512; Czechoslovakia 900.
Nickel including alloys, all forms	354	112	Greece 74; West Germany 33.
Platinum group including alloys, all forms, palladium troy ounces	15,947	23,149	Switzerland 6,687; West Germany 5,112; Hungary 3,858.
Selenium, elemental kilograms	13,190	14,544	West Germany 13,394; United States 1,000.
Silicon	23	5,707	United Kingdom 1,645; Italy 1,023; West Germany 995.
Silver including alloys thousand troy ounces	3,283	3,242	West Germany 3,064; United Kingdom 178.
Tin including alloys, all forms long tons	265	45	Belgium 20; Italy 16.
Vanadium oxides	75	--	
Zinc:			
Ores and concentrates	31,007	27,023	Bulgaria 22,147; Belgium 2,678; France 2,198.
Oxide	1,543	1,049	Hungary 694; Czechoslovakia 230; Bulgaria 125.

See footnotes at end of table.

Table 2.—Yugoslavia: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS—Continued			
Zinc—Continued			
Metal including alloys:			
Unwrought	31,033	23,296	Italy 13,589; Greece 4,434; Czechoslovakia 3,147; United Kingdom 952.
Semimanufactures	19,351	13,358	Denmark 2,896; West Germany 2,360; France 1,986; Czechoslovakia 1,505.
Other:			
Ores and concentrates	37	3,091	Italy 2,616; Japan 475.
Ash and residue containing nonferrous metals	7,851	7,719	Italy 3,492; West Germany 2,404; Austria 1,400.
Metals n.e.s	--	1	All to Switzerland.
NONMETALS			
Abrasives, natural, grinding and polishing wheels and stones	1,612	1,936	Poland 1,320; Italy 241; West Germany 222.
Asbestos	2,449	4,741	United States 3,795; Netherlands 445; West Germany 250.
Barite and witherite	52,926	42,755	U.S.S.R. 19,602; Hungary 13,560; Italy 3,986.
Boron material, all forms	2,212	--	
Cement, hydraulic:			
Portland	131,903	21,725	Libya 10,900; Saudi Arabia 4,500; Malta 3,200.
Other	36,585	7,713	United States 2,326; Italy 1,660; Austria 1,588.
Chalk	7	16	Czechoslovakia 12; East Germany 4.
Clays and products:			
Crude:			
Bentonite	22,335	21,590	Czechoslovakia 7,933; East Germany 4,471; Poland 3,436.
Fire	26,741	29,525	Italy 14,509; Hungary 11,641; Czechoslovakia 3,334.
Kaolin (china)	59	31	East Germany 22; Czechoslovakia 9.
Other	160	349	Austria 221; Italy 128.
Products (including all refractory brick):			
Refractory	62,975	69,944	West Germany 31,423; Romania 13,934.
Nonrefractory	5,397	6,931	Czechoslovakia 3,471; Hungary 2,698.
Diatomaceous earth	1,236	619	Greece 446; Switzerland 98; East Germany 65.
Feldspar	18,083	16,840	Czechoslovakia 5,750; East Germany 5,464; Hungary 2,946.
Fertilizer materials manufactured:			
Nitrogenous	26	8,350	France 6,800; West Germany 1,500.
Phosphatic	110,913	33,128	All to Bulgaria.
Potassic	3	--	
Other including mixed	837	23,645	Hungary 12,560; Italy 6,418; Czechoslovakia 4,167.
Ammonia	1,034	1	All to Pakistan.
Gypsum and plaster	1,839	10,954	Hungary 10,935.
Lime	688	19,780	Hungary 19,778.
Magnesite:			
Raw	898	1,595	Italy 1,580; Austria 15.
Calcined	9,559	7,917	Romania 3,023; Netherlands 1,478; West Germany 1,099.
Sintered	73,521	97,512	Poland 28,488; United States 25,166; Italy 19,407.
Pigments, mineral:			
Natural crude	13	--	
Iron oxides, processed	10	--	
Pyrites, gross weight	109,327	51,533	West Germany 20,135; Arab Republic of Egypt 12,895; Greece 8,800.
Salt	10	102	All to Hungary.
Sodium and potassium compounds n.e.s	13,651	26,563	Italy 21,078; Indonesia 1,300; Malaysia 1,000.
Stone, sand and gravel:			
Dimension, crude, partly worked	48,676	52,944	Italy 40,047; West Germany 4,829.
Gravel and crushed stone	53,427	19,687	Italy 19,666.
Limestone	--	15	All to Hungary.
Quartz and quartzite	10,132	12,322	West Germany 7,608; Austria 4,163.
Sand excluding metal bearing	6,430	585	Italy 578.
Sulfur:			
Elemental, all forms	1,080	624	Romania 590.
Sulfur dioxide	273	87	All to West Germany.
Sulfuric acid	41,427	41,084	Italy 19,766; Hungary 12,323; Turkey 4,200.
Talc, steatite, soapstone, and pyrophyllite	657	--	
Slag, dross, and similar waste not bearing:			
From iron and steel manufacture	5,530	453	Italy 327; West Germany 78; Austria 48.
Slag and ash n.e.s	3,320	204	All to Italy.

See footnotes at end of table.

Table 2.—Yugoslavia: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations 1970
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	81	288	All to Guinea.
Carbon black and gas carbon:			
Carbon black	6,413	596	Czechoslovakia 545.
Gas carbon	783	208	Poland 152; Italy 56.
Coal:			
Bituminous coal	1,280	2,296	Greece 1,850; Austria 386.
Coal dust	66,014	62,140	Italy 61,420.
Brown coal	12,134	35,623	Austria 33,950.
Lignite	37,987	129,743	Italy 75,105; Austria 51,358.
Coke and semicoke	112,846	132,177	Switzerland 81,994; France 12,311; Bulgaria 9,384.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	1,756	568	Mainly to Austria.
Refinery products:			
Gasoline (including natural) do	829	1,131	Austria 447; Netherlands 275; Italy 186.
Kerosine and jet fuels do	192	241	United Kingdom 80; West Germany 46; East Germany 17.
Distillate fuel oil do	470	938	Italy 551; Austria 145; West Germany 76.
Residual fuel oil do	161	1,005	Italy 428; Netherlands 213; Austria 190.
Lubricants do	1	10	NA.
Other do	31	507	Italy 217; Hungary 193.
Total do	1,684	3,832	
Mineral tar and other coal, petroleum, or gas derived crude chemicals	4,425	--	

r Revised. NA Not available.

Table 3.—Yugoslavia: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum:			
Bauxite and concentrates thousand tons	225	258	Australia 230.
Alumina	6,040	6,472	Greece 5,330; West Germany 962.
Metal including alloys:			
Unwrought	39,991	68,615	U.S.S.R. 28,934; United States 15,782; Switzerland 7,019.
Semimanufactures	9,105	18,458	West Germany 4,711; Austria 4,338; U.S.S.R. 1,995.
Scrap	22	12	All from Bulgaria.
Antimony:			
Ore and concentrate	1,340	1,939	Turkey 870; West Germany 700; Netherlands 369.
Metal including alloys, all forms	1,348	16	Switzerland 8; Netherlands 4; Italy 2.
Arsenic:			
Oxide	771	58	Austria 54.
Metal and alloys, all forms	8	7	West Germany 4; Sweden 3.
Beryllium including alloys, all forms kilograms	53	507	West Germany 500.
Bismuth including alloys, all forms	13	21	Switzerland 12; Netherlands 4; United Kingdom 3.
Cadmium kilograms	21	2,797	U.S.S.R. 1,500; Italy 1,000; West Germany 297.
Chromium:			
Chromite, gross weight	66,478	68,472	Albania 58,078; Iran 8,024; United Kingdom 2,347.
Oxide, hydroxide and chromic acid, anhydrous	543	699	West Germany 359; U.S.S.R. 185; Hungary 83; Poland 70.
Metal including alloys, all forms	13	5	Mainly from United Kingdom.
Cobalt:			
Oxide and hydroxide	20	34	Belgium 13; Switzerland 10; United Kingdom 6.
Metal including alloys, all forms	55	57	Belgium 43; United Kingdom 12.
Columbium and tantalum, tantalum including alloys, all forms kilograms	4,588	472	United States 284; Belgium 106; Austria 36; Italy 19; West Germany 14.

Table 3.—Yugoslavia: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS—Continued			
Copper:			
Ore and concentrates	4,216	2,744	All from United Kingdom.
Copper sulfate	985	1,812	U.S.S.R. 1,202; Hungary 610.
Metal including alloys:			
Scrap	1,917	2,123	United States 1,041; United Kingdom 898.
Unwrought:			
Blister and other unrefined unalloyed	10,818	12,397	United Kingdom 11,298; United States 774.
Refined and alloys	21,585	39,635	United Kingdom 34,711; Bulgaria 3,220.
Semimanufactures	8,105	11,348	West Germany 4,537; United Kingdom 4,065; Austria 918.
Germanium including alloys, all forms kilograms	6	6	Japan 3; United Kingdom 2; Belgium-Luxembourg 1.
Iron and steel:			
Ore and concentrate	263,590	211,556	India 180,655; Sweden 20,346; Sudan 8,148.
Scrap	78,170	146,727	U.S.S.R. 44,007; Switzerland 43,199; Lebanon 39,781.
Pig iron including cast iron	215,483	171,535	U.S.S.R. 99,516; Czechoslovakia 23,354; East Germany 13,083.
Sponge iron, powder and shot	1,486	1,342	Sweden 967; Italy 172.
Ferroalloys:			
Ferromanganese	169	568	Italy 415; United Kingdom 100.
Other	3,303	3,162	West Germany 878; Switzerland 633; Austria 440; United Kingdom 414.
Steel, primary forms:			
Ingots	103	--	
Blooms, billets, slabs	142,928	100,136	U.S.S.R. 55,916; Czechoslovakia 30,631; Romania 6,807.
Coils for rerolling	9,451	9,474	Poland 7,510; Czechoslovakia 1,007; U.S.S.R. 957.
Steel semimanufactures:			
Bars, rods, angles, shapes and sections	95,387	219,616	Czechoslovakia 75,535; West Germany 32,250; Bulgaria 31,125.
Universals, plates and sheets	489,727	607,320	Japan 157,823; West Germany 127,236; Greece 82,701; Czechoslovakia 48,583.
Hoop and strip	87,407	160,150	Czechoslovakia 93,015; Japan 16,486; West Germany 13,064.
Rails and accessories	3,580	3,883	West Germany 1,493; Austria 1,458.
Wire	16,794	19,962	West Germany 13,417; Austria 1,879; Czechoslovakia 1,851; Italy 1,131.
Tubes, pipes and fittings	39,852	67,302	Bulgaria 21,412; West Germany 14,170; Hungary 10,945.
Castings and forgings, rough	873	858	Czechoslovakia 497; West Germany 153; Poland 85.
Total	733,620	1,079,091	
Lead:			
Ores and concentrates	2,833	--	
Oxides	620	451	West Germany 310; Switzerland 100; Austria 40.
Metal including alloys:			
Scrap	467	22	All from Libya.
Unwrought	4,617	5,595	Switzerland 2,058; Bulgaria 1,662; Italy 1,081.
Semimanufactures	249	740	West Germany 488; Netherlands 150; Switzerland 100.
Magnesium including alloys, all forms	615	896	U.S.S.R. 475; Norway 146; Switzerland 106; United States 100.
Manganese:			
Ores and concentrates	53,783	48,240	U.S.S.R. 30,981; Brazil 16,564.
Oxides	279	491	Netherlands 212; United States 140; Japan 80.
Metal including alloys, unwrought	153	190	Sweden 82; Switzerland 42; United Kingdom 40.
Mercury 76-pound flasks	1,585	380	United Kingdom 150; United States 130; Switzerland 100.
Molybdenum including alloys, all forms kilograms	9,834	23,672	Austria 20,392.
Nickel:			
Matte, speiss, and similar materials	59	--	
Metal including alloys:			
Scrap	167	212	All from Switzerland.
Unwrought and semimanufactures	1,414	1,554	Italy 459; West Germany 435; Netherlands 186; Switzerland 138.

Table 3.—Yugoslavia: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS—Continued			
Platinum group:			
Platinum, all forms troy ounces	[r]2,820	1,207	U.S.S.R. 788; Italy 222; West Germany 197.
Palladium, all forms do	[r]14,253	26,146	U.S.S.R. 26,042.
Rare earth including alloys, all forms kilograms	143	145	All from West Germany.
Selenium, elemental do	1,860	3,114	West Germany 2,110; Albania 1,000.
Silver, all forms thousand troy ounces	2,256	1,333	West Germany 448; Austria 247.
Tellurium, elemental kilograms	200	197	All from West Germany.
Tin:			
Oxides long tons	16	26	West Germany 24.
Metal including alloys:			
Scrap do	--	305	Switzerland 220; West Germany 85.
Unwrought do	1,039	1,609	Malaysia 1,174; Indonesia 225; United Kingdom 181.
Semimanufactures do	39	83	West Germany 67; Italy 12.
Titanium:			
Ore and concentrate	1,771	1,427	United Kingdom 1,244.
Oxides	5,120	5,636	West Germany 3,870; United Kingdom 905.
Metal including alloys, all forms kilograms	4,341	27,784	Italy 24,150; United Kingdom 3,137.
Tungsten including alloys, all forms do	15,869	20,281	Netherlands 7,179; Sweden 7,091; United Kingdom 2,906.
Uranium and thorium:			
Ore and concentrate do	--	200,000	All from India.
Metal including alloys, all forms do	70	--	
Zinc:			
Ores and concentrates	50,681	13,666	Tunisia 4,653; Switzerland 3,437; Italy 2,234; West Germany 2,092.
Oxides	59	76	Mainly from West Germany.
Metal including alloys:			
Scrap and blue powder	1	26	All from Italy.
Unwrought	11,714	13,232	Zambia 9,901; Bulgaria 2,820; Switzerland 450.
Semimanufactures	211	760	West Germany 531; Italy 186.
Zirconium including alloys, all forms kilograms	2,088	1,109	West Germany 1,108.
Other:			
Ores and concentrates	410	477	United Kingdom 393; Switzerland 70.
Ash and residue containing nonferrous metals	31	520	United States 275; Austria 140; Italy 105.
Oxides, hydroxides and peroxide of metals n.e.s	286	477	West Germany 178; Norway 67; U.S.S.R. 67.
Metal including alloys	[r]3	14	United States 10; United Kingdom 2; Austria 1.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc.	557	987	West Germany 300; Denmark 253; Greece 170; Italy 163.
Grinding and polishing wheels and stones	1,322	1,632	Austria 1,134.
Asbestos	26,462	28,552	U.S.S.R. 17,849; Botswana 6,145; Canada 3,394.
Barite and witherite	1,278	513	West Germany 320; Switzerland 148.
Boron materials:			
Crude, natural borates	521	1,731	Turkey 1,000; United States 730.
Oxide and acid	107	405	U.S.S.R. 217; Czechoslovakia 90; West Germany 61.
Bromine kilograms	1,691	6,247	United Kingdom 6,092; West Germany 155.
Cement:			
Portland thousand tons	975	1,478	Arab Republic of Egypt 335; Romania 314; U.S.S.R. 271; Czechoslovakia 201.
Other do	100	165	Austria 119; Turkey 38.
Chalk	451	929	France 321; East Germany 265; Switzerland 160.
Clays and products:			
Crude n.e.s.:			
Bentonite	3	42	Hungary 20; Austria 16.
Fire (including calcined)	34,753	33,019	Czechoslovakia 24,855; Poland 5,775; West Germany 1,806.
Fuller's earth, dinas, chamotte	1,813	4,060	Austria 2,480; West Germany 1,014; France 420.
Kaolin	36,163	37,463	Czechoslovakia 19,828; East Germany 7,332; Greece 4,784.
Other	3,192	1,247	Czechoslovakia 571; West Germany 459; Netherlands 104.

See footnotes at end of table.

Table 3.—Yugoslavia: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
NONMETALS—Continued			
Clays and products—Continued			
Products:			
Refractory (including nonclay bricks)	19,083	16,196	West Germany 6,189; East Germany 3,564; France 2,133.
Nonrefractory	96,201	289,949	Italy 180,853; Romania 24,836; Hungary 21,229.
Diamond, all grades ... carats	72,725	138,085	West Germany 43,950; United Kingdom 26,900; Switzerland 21,835.
Diatomite and other infusorial earths	1,210	1,417	Austria 1,188; Italy 144.
Feldspar ... kilograms	^{r}2,000	--	
Fertilizer materials:			
Crude:			
Phosphatic	727,359	789,673	Morocco 324,621; Jordan 208,907; Tunisia 202,342.
Potassic	7,722	2,796	All from East Germany.
Manufactured:			
Nitrogenous	329,882	80,158	U.S.S.R. 28,887; Poland 25,225; Bulgaria 21,400.
Phosphatic:			
Thomas slag	26,500	7,850	All from Arab Republic of Egypt.
Other	29,053	--	
Potassic	201,861	304,197	East Germany 139,887; U.S.S.R. 116,950; West Germany 23,066.
Other including mixed	3,400	--	
Ammonia	46,235	68,354	Hungary 24,587; Austria 16,953; Greece 11,428.
Fluorspar and cryolite	5,639	6,835	East Germany 5,839; Italy 574; West Germany 240.
Graphite, natural	999	1,788	Austria 1,462; West Germany 252.
Gypsum and plaster	16,134	19,987	Italy 19,986.
Iodine ... kilograms	9,751	11,644	Poland 5,449; United States 2,495; United Kingdom 2,000.
Lime	27	3,225	Austria 3,214.
Magnesite	427	720	Austria 482; Netherlands 197.
Mica:			
Crude including splittings and waste	86	165	United Kingdom 50; Norway 50; Austria 35.
Worked including agglomerated splittings	77	466	Austria 387; Czechoslovakia 24.
Pigments, mineral:			
Natural, crude	35	51	Hungary 50.
Iron oxides, processed	1,878	2,921	West Germany 1,438; Switzerland 786; Netherlands 249.
Precious and semiprecious stones except diamond ... kilograms	^{r}235	167	NA.
Pyrite (gross weight)	52,915	94,723	U.S.S.R. 94,705.
Quartz, piezoelectric ... kilograms	838	1,573	United Kingdom 815; West Germany 750.
Salt	171,043	145,445	Poland 90,009; Tunisia 36,252; United Arab Republic 18,330.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	15,912	17,770	West Germany 12,419; Italy 4,139.
Caustic potash, sodic and potassic peroxides	2,123	2,424	East Germany 1,988.
Stone, sand and gravel:			
Dolomite, chiefly refractory grade	5,579	5,831	Italy 5,549.
Gravel and crushed rock	74,522	160,800	Hungary 134,596; Austria 22,653.
Limestone except dimension	24,190	16,242	Hungary 16,236.
Quartz and quartzite	6,034	9,825	Hungary 5,902; West Germany 3,342.
Sand excluding metal bearing	82,717	81,063	Italy 48,057; Hungary 17,666; West Germany 7,097.
Dimension:			
Crude and partly worked	4,943	17,866	Austria 17,518.
Worked	492	3,626	Italy 3,579.
Sulfur:			
Elemental, all forms	22,732	20,596	West Germany 10,588; Poland 5,862; Italy 4,105.
Sulfuric acid	140	356	Albania 352.
Talc and related materials	1,539	1,396	Italy 487; India 360; Czechoslovakia 321.
Other nonmetals n.e.s.:			
Crude	99	427	Austria 381.
Slag, dross, and similar waste, nonmetal bearing	63,055	107,731	U.S.S.R. 107,155.

See footnotes at end of table.

Table 3.—Yugoslavia: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	3,264	18,705	Romania 15,535; Albania 2,064.
Carbon black and gas carbon	1,669	2,471	Italy 1,084; West Germany 973.
Coal, anthracite and bituminous thousand tons	1,830	1,820	U.S.S.R. 1,116; Czechoslovakia 531.
Coke and semicoke do	120,928	201	West Germany 67; Italy 47; Poland 32.
Hydrogen, helium, and rare gases kilograms	7,874	35,845	Italy 25,097; Austria 9,340.
Peat including briquets and litter	462	2,346	Poland 1,587.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	23,867	33,053	Iraq 14,940; U.S.S.R. 10,921; Iran 7,192.
Refinery products:			
Gasoline including natural do	202	258	United Kingdom 90; Romania 83; Italy 65.
Kerosine and jet fuel do	39	174	Romania 161.
Distillate fuel oil do	1,956	2,876	Romania 1,174; U.S.S.R. 1,106; Italy 514.
Residual fuel oil do	2,524	2,809	U.S.S.R. 1,803; Romania 807.
Lubricants do	364	411	Hungary 102; West Germany 83; Romania 74.
Mineral jelly and wax do	40	1,040	Italy 319; Albania 285; Czechoslovakia 128.
Other do	486		
Total do	5,611	7,568	
Mineral tar and coal, petroleum, or gas derived crude chemicals	43,144	48,552	U.S.S.R. 16,011; Italy 14,043; Czechoslovakia 5,216.

r Revised. NA Not available.

COMMODITY REVIEW

METALS

Aluminum.—During 1971 Yugoslavia remained a significant producer and exporter of bauxite, and a modest producer of aluminum metal. Annual aluminum production during 1968–71 has plateaued at about 48,000 tons. The major development in the aluminum industry in Yugoslavia in 1971 involved the processing segment of the industry. Plants under construction included alumina and aluminum producing facilities at Titograd, having capacities of 50,000 of aluminum metal and 200,000 tons of alumina per year; two plants at Šibenik each having a capacity of 50,000 tons of aluminum metal per year; an alumina facility at Obrovac, with a capacity of 300,000 tons per year; another alumina plant at Mostar capable of producing 200,000 tons yearly, and a 50,000-ton-per-year aluminum rolling facility at Sevojno. Policy goals are to shift the country from an exporter of bauxite to a producer and exporter of alumina, aluminum metal, and aluminum semimanufactured products. All of the Yugoslav aluminum projects were in different stages of construction; the Titograd plant started trial production in 1971.

The Adriatic littoral remained the principal bauxite-producing area followed by the bauxite-bearing region of Bosnia and Hercegovina. The intensive development of mines near Mostar, Vlasenice, Jajce, and Bosanska Krupa, together with extensive exploration for bauxite in Bosnia and Hercegovina continued during 1971. Approximately one-third of the country's output comes from inland regions.

Copper.—The expansion of Bor-Majdanpek copper mining region and the Bor smelter complex was completed in late 1971. As of December 31, 1971, the capacity to produce electrolytic copper at Bor reached 100,000 metric tons per year. The latest expansion started in 1961 when Bor's electrolytic capacity was about 40,000 tons of copper per year. The mines at Bor and Majdanpek were expanded accordingly and their mining and processing capacity was elevated to 12 million tons of ore per year. In addition three sulfuric acid plants with an aggregate capacity of 500,000 tons per year of sulfuric acid, based on smelter gases, were operational at yearend. Feasibility studies were prepared which considered doubling Bor's electrolytic capacity. Large copper reserves were discovered in the vicinity of Bor, at Krivelj. The 600-million-ton ore body with an average copper content of 0.4 percent appears to provide a solid raw material base for increased output at Bor. In addition the exploration for copper ore continued during 1971. A copper ore discovery at Kosjerić in Serbia was reported. The estimated reserves were set at about 3 million tons with an average copper content of 2.5 percent. Studies were underway to determine feasibility of copper ore production from an ore body at Bačine, near Radovište in Macedonia, containing an estimated 100 million tons of 0.5 percent copper ore. The activity was partially financed by private funds from the United States.

Iron and Steel.—The slowly implemented expansion plans for the iron and steel industry showed some results during 1971. Significantly, pig iron production at the new iron and steel plant near Smederevo began and an agglomeration plant at Zenica was completed.

During 1971 most of the domestic output of iron ore came from the Vareš and Ljubija mines in Bosnia and the Tajmište mine in Macedonia. The output of iron ore remained on the same level as in 1970. Imports of iron ore covered about 7 percent of total iron ore supply. The exploration of large iron ore deposits discovered in 1969 in the vicinity of Ljubija near Omarska continued. Results confirmed 200 million tons of reserves ranging in quality from 50 to 60 percent iron.

Yugoslavia's largest blast furnace, a 720,000-ton-per-year furnace at the new iron and steel plant near Smederevo, was fired during September 1971. In addition, a natural gas pipeline from Banat, an agglomeration plant at Smederevo, an associated power plant, and a railroad spur were completed. Plans for Smederevo call for the construction of an 840,000-ton-per-year converter steel unit, a 200,000-ton-per-year cold-rolling plant, and an 800,000-ton-per-year hot-rolling plant. The latter unit is being financed with a loan equivalent to $100 million from the West German firm Tisen.[2] About 60 percent of the loan will be for West German equipment. The remainder will be repaid with deliveries from the new hot-rolling plant.

During 1971 the 1-million-ton-per-year agglomeration unit of the Zenica iron and steel plant in Bosnia was completed and began test production. This unit was designed by U.S.S.R. engineers. In addition, construction of a new converter steel plant with two 100-ton vessels and three continuous casting lines began in the fall of 1971. It is expected the new steel converter plant will be operational in 1974. Renovation and expansion of the Sisak Iron and Steel Works started during 1971. The steelmaking capacity is being increased by 100,000 tons per year for a new total of 400,000 tons per year, and a continuous casting plant is being installed. The installation of a 50,000-ton-per-year seamless pipe mill will raise the pipe-making capacity to 215,000. Data on pipe sizes were not given. Plans call for increasing pipe-making capacity at Sisak to 245,000 tons by 1975.

The plans for "Boris Kidric" Steel Works envisage an increase in capacity from the present 180,000 metric tons per year to 350,000 metric tons by 1975. The expansion will include additional Siemens Martin furnaces and renovation of existing ones. Furthermore, two new electric furnaces with an annual capacity of 50,000 tons each will be included in the expansion. The total expansion costs were put at $81.3 million,[3] of which $40 million will be a credit offered by a Belgian consortium. The rest of funding will come from company funds, local banks, and the Government of Crna Gora.

The Store Slovenia Iron and Steel Works was expanded during the year by the installation of a 30,000-ton-per-year unit to produce springs and others specialty items. Future expansion is scheduled to raise the annual output of special rolled products at this plant to 100,000 tons by 1975. With assistance from U.S.S.R. experts, preliminary work on exploring possibilities for construction of a new integrated iron and steel works near Prijedor in Bosnia started in 1971. The new smelter will be based on new iron ore reserves recently discovered in the general area of Ljubija; however, plant capacities have not been announced.

Lead and Zinc.—The shortage of concentrates, created by the lack of adequate lead and zinc mining facilities persisted during 1971. Several projects are underway in order to reduce the need for importing zinc concentrates. The new mine at Besna Kobila and the lead and zinc smelter at

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[2] Privredni Pregled (Belgrade). June 1, 1971, p. 9.

[3] Where necessary, values have been converted from Yugoslavian Dinars (Din.) to U.S. dollars at the rate of Din. 17.5=US$1.00.

Titov Veles reportedly will be completed during 1972.

Nickel.—The development of nickel deposits at Goleš Mountain near Priština in Serbia and preliminary plans for developing nickel deposits in Macedonia continued during 1971. Most of the operations at Goleš Mountain nickel deposits were proceeding according to plan, however, the beneficiation plant will be completed in 1972 instead of 1971. Development of the Ržanovo nickel deposits in Macedonia were in the financial planning stage. The new organization, FENI, was negotiating with several foreign financial sources including a French banking consortium. Results of negotiations have not been reported.

Other Metals.—Yugoslavia produced small quantities of a variety of other metals during 1971. Antimony was produced at Zajača in Serbia and chromite was produced in Raduša and other locations in Macedonia. Bismuth, cadmium, and silver are produced as byproducts of the Trepča lead and zinc plant in Serbia. The Bor copper complex yields byproduct gold and silver. Byproduct cadmium is also produced at the Zorka zinc facility in Šabac, Serbia.

Except for mercury which is produced at Idrija in Slovenia, Yugoslavia's production of these other metals is of little world significance. Most of their production trends followed the trends of other minerals commodities. The output of antimony and chromite continued their downtrend, of recent years, whereas byproduct production trends reflect that of the primary product.

NONMETALS

Cement.—Expansion and modernization of Yugoslavia's cement industry continued during 1971. The policy goals were to build new cement producing facilities so that imports may be eventually eliminated; however, because of increasing demand, imports of cement will continue during 1972. The larger domestic output in 1971 resulted from the following plants reaching production capacity levels: Boečin in Serbia; Usje near Skopje in Macedonia; Goražde in Bosnia; and Trbovlje in Slovenia.

Cement shortages necessitated imports of 1.4 million tons of cement in 1971. The country has ample reserves of raw materials for cement production. Access to the Kosjerič area, which is rich in calcareous hydraulic materials, will be enhanced by the completion of the Belgrade-Bor railroad now under construction. To eliminate imports and reenter the export market the authorities decided to start construction of several new cement plants. Construction of a 400,000-ton-per-year cement plant began near Kosjerič in Serbia. The plant can be expanded by an additional 400,000 tons per year. In addition, cement plants at Kakanj and Lukavac in Bosnia; Podsused near Zagreb; Ostružnica and Popovač in Serbia, with an aggregate capacity of 2.5 million tons of cement per year, were in different stages of planning or construction during 1971.

Fertilizer Materials.—Exploration of phosphate deposits at Lisina near Bosiljgrad continued at a slow pace during 1971. Results so far confirm that the Lisina deposits contain about 40 million tons of indicated ore with an average P_2O_5 content of 12 percent. The deposits reportedly are unique in the country. The Prahovo Fertilizer Plant near Prahovo in Serbia, part of the Bor copper complex, was financing part of the exploration costs.

Lime.—The capacity of the Kičevo lime production and processing facilities in Macedonia has been increased to 90,000 tons per year by the expansion of nearby quarries and modernization of the lime hydration plant.

Magnesite.—A new 54,000-ton-per-year magnesite sinter plant was under construction at yearend near Kosovska Kamenica. Investments in the plant are expected to reach $2 million. Completion date was set for the end of 1973. All plant production will be delivered to the Magnohrom refractory plant near Kraljevo.

Salt.—The salt output of the Tuzla salt basin in Bosnia is slowly shifting from brine to rock salt production. The brine wells started to dry up in the basin recently. The present yearly output of rock salt of 90,000 tons is planned to increase to 700,000 tons per year.

MINERAL FUELS

During 1971 coal remained the country's principal source of energy. However, crude oil and natural gas increased their combined share of total energy input to about 38 percent, the largest since World War II.

Most of Yugoslavia's coal production, which increased by 8.7 percent over 1969, consisted of low-rank coals. Consequently significant quantities of anthracite, coking coals and coke were imported to meet the demand. In 1971 domestic crude oil output higher by 3.7 percent than in 1970, supplied about 34.5 percent of the country's refinery throughput of 8.5 million metric tons. Substantial imports of liquid fuels, mostly crude oil, were necessary, as the domestic economy continue to expand.

The use of natural gas as both an energy source and a raw material for petrochemicals increased. However, wider use of natural gas for heating purposes was hampered by lack of a national gas pipeline grid. Although several electric power plants started production during 1971, power shortages continued to be a serious problem for the country's major industrial consumers of electricity. During the winter, shortages of fuels persisted in large cities indicating weaknesses in the distribution system of the country.

Coal.—Financial and labor problems made 1971 a difficult year for the coal industry. However, the production increases in the second half of the year minimized the adverse effects of these problems.

Most of the activities in the coal industry were centered around the following large coal basins: Kolubara, Kosovo, Aleksinac, and Kostolac in Serbia, and the Banoviči-Kreka and Central Bosnian Mines in Bosnia and Hercegovina. In these basins efforts were directed primarily toward streamlining mine production and improving or expanding operations at associated powerplants and gas plants, the major users of domestic coals.

In the Kolubara lignite basin, located about 30 miles west of Belgrade, preparations for opening a new opencast lignite mine named "Tamnava" were underway during 1971. The new mine will produce 24 million tons per year from about 700 million tons of recoverable reserves. The new mine located near the villages of Skobalj, Brgule, Radljevo, and Mali Borak will employ about 1,200 workers when fully operational in the beginning of 1978. The total investments in the new mine are reportedly equivalent to $80 million. The principal consumers of Tamnava lignite will be nearby thermal powerplants, the existing Obrenovac plant and the planned 200-megawatt plant at Crljeni.[4]

The Central Bosnian Mines had problems in supplying its consumers with adequate quantities of coal because of labor shortages. At the same time shortages of railroad cars made the financial situation of mines more difficult.

The brown coal mine "Soko" at Čitluk near Soko Banja was temporarily closed because of a fire in the summer of 1971. About 380 miners will be jobless until the mine is reopened, scheduled for early 1972.

Reportedly, "large" brown coal reserves were discovered along the Belgrade-Niš highway near the Aleksinac mines. No details on quantities were disclosed.

The coke demand in Yugoslavia will increase with new iron and steel producing facilities going on stream in the early seventies. Domestic coke production, however, will fall short of demand until 1974 or 1975 when new plants will be completed. Until then demand will be met with imports.

Petroleum and Gas.—During 1971 petroleum industry developments were highlighted by offshore Adriatic exploratory drilling, development drilling in Slavonia, new discoveries (mostly gas) in northern Serbia, and development of an oilfield near the Hungarian border. Although production of crude oil and natural gas increased when compared with output in 1970, no major new fields were put into production. Increases were accomplished by the further development of existing fields. Industrija Nafte (INA) headquartered in Zagred, and Naftagas in Novi Sad, remained the most important producers and processors of crude oil in the country.

Exploration and Development.—INA, through its exploration and production division, Naftaplin, was the larger producer of crude oil accounting for about 70 percent of the total. Offshore drilling by Naftaplin in the vicinity of Dugi Otok Island in the Adriatic Sea was terminated during the Spring of 1971. Two dry holes were drilled with No. 3 reaching a total depth of 4,218 meters and well No. 4 was plugged back as dry at depth of 3,120 meters.

The drilling was performed by the French firm Société des Forages en Mer "Neptun" with its rig "Neptun" 2. Reportedly, the findings were promising, however, before deciding on further offshore drilling Naftaplin planned to thoroughly analyze data obtained from the four dry wells drilled during 1970–71.

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[4] Privredni Pregled (Belgrade). May 4, 1971, p. 4.

The development of Beničanci oilfield in Croatia by Naftaplin continued during 1971 and production is expected to start in 1972. About 22 wells were drilled and a pipeline to Slavonski Brod was near completion at yearend. The planned production for 1972 was reported at 300,000 tons.

Naftaplin announced a new oil discovery in the vicinity of the Lipovljani oilfield near Novska in Croatia. Except for a potential production of 300,000 tons per year of crude oil from the new field, no other information was disclosed. Existing facilities at the nearby Lipovljani field will be used for handling and storing crude oil. A new well was drilled in the vicinity of Tuzla, but no results of drilling have been published.

With an output of 2,142,000 tons in 1971, Naftaplin continued to be the leading producer of crude oil in the country. Although the 1971 output was higher by about 4.1 percent compared with results in 1970, Naftaplin failed by 58,000 tons to fulfill its 1971 production plan. Žutica oilfield, located about 30 miles east of Zagreb in the Sava River Basin, remained the country's largest producing field with an output of 675,000 tons. The next largest fields in 1971 were Stružec and Šandrovac which produced 475,000 and 340,000 tons, respectively. In 1971 INA obtained a $7.3 million loan from U.S. banks to purchase oilfield equipment in the United States.

Naftagas, the country's only other crude oil producer, accounted for 30 percent of the total output in 1971. During the year Naftagas discovered accumulations of hydrocarbons (mostly gas) near Čentavir, Dolovo in the Banat area, Bačka Topola, and Prigrevica near Bačka Palanka in Bačka. Development of an oilfield near the town of Kelebija close to the Hungarian border continued and the field is expected to go into production in 1972 at a rate of 50,000 tons per year. Most of the Naftagas's production comes from fields near Kikinda, and Mokrin, in Bačka, and Velebit in the Banat area.

Refining.—No major events were reported in the refining industry of Yugoslavia. The country's six refineries have a total annual capacity of 12.8 million tons and operated at 68 percent of installed capacity during 1971. The following tabulation shows capacity of each refinery in million metric tons per year:

Operating company	Location	Capacity, million tons per year
Industrija Nafte	Lendava	0.2
Do	Rijeka	4.5
Do	Sisak	3.6
HENA	Bosanski Brod	2.5
Naftagas	Novi Sad	1.4
Do	Pancevo	.6
Total		12.8

Except for Lendava, all petroleum refineries had expanded and/or were adding new facilities during 1971. At the Rijeka refinery the atmospheric distillation capacity was increased by 2 million tons per year and a new isomerisation plant was under construction. A new lube plant and a catalytic hydrotreater (Unifining) were built at Sisak. In addition facilities for processing an additional 2 million tons of crude per year were under construction at yearend. At the Bosanski Brod plant (near Modrica) new dewaxing and lubricant blending facilities were under construction. At the Pančevo refinery, an additional 1.5-million-ton-per-year atmospheric distillation unit was under construction and at Novi Sad a vacuum distillation unit, a lube plant, and an asphalt plant were built.

At yearend INA was building a lube plant at the existing lubricant blending plant located at Žitnjak in Zagreb. The plant will have a capacity of 12,000 tons of lubricants per year when completed in 1972. Two new refineries are being considered, one at Koper in Slovenia and the other at Skoplje in Macedonia. A feasibility study was underway. A new petrochemical plant is under construction at the Rijeka refinery. When completed in 1974, the annual capacity will include 300,000 tons of ethylene, 200,000 tons of vinyl chloride, 25,000 tons of plasticizers, 100,000 tons of cumene, and 150,000 tons of polyethylene. Engineering plans are being prepared for a petrochemical complex at Pančevo as part of Hemiska Industrija organization. The annual capacity of this plant, when completed in 1974 includes 200,000 tons of ethylene, 88,000 tons of propylene, 110,000 tons of gasoline, and 100,000 tons of vinyl chloride.

Pipelines.—The major pipeline development in Yugoslavia during 1971 centered around the continuing controversy on construction plans for two pipelines from the Adriatic coast to inland refineries. One is planned by INA and involves a line from

Bakar, near Rijeka, to Belgrade, via Sisak and Bosanski Brod. The other planned by Energoinvest of Sarajevo envisages a line from Naum, near Ploče to Bosanski Brod. Both lines have planned extensions into other East European countries. According to Yugoslav sources, there is need for no more than one line. Although INA announced that its line was under construction, nothing has been reported on the progress of either line. In addition another trunk pipeline was in the making. The new refinery planned for Skopje in Macedonia reportedly will be connected by a crude oil pipeline with the port at Saloniki. Naftagas is building a 20-inch natural gas pipeline from its fields in Bačka and Banat to Belgrade. It is expected that by 1976 the line will be extended to Niš and to Loznica, by that time the spur to Hungarian border should be completed and imports of Hungarian gas could start.

To meet the increasing demand for natural gas and liquefied petroleum gases a natural gas processing plant was built in 1971 by Naftagas at Mokrin in Serbia. Reportedly, its input capacity is about 1 billion cubic meters per year. The large lignite gasification plant located near Obilič in Kosovo, Serbia, and commissioned in 1970 was on trial production throughout 1971. Mechanical difficulties at the plant hampered regular pipeline deliveries of gas to consumers in Skopje.

The Mineral Industry of Zaire
(Formerly the Democratic Republic of the Congo (Kinshasa)

By Harold J. Schroeder[1]

On October 27, 1971, the Democratic Republic of the Congo (Kinshasa) changed its name to the Republic of Zaire. Other name changes included the following: The Congo River became the Zaire River; Katanga Province became Shaba Province; Orientale Province became Haut-Zaire Province; and Kongo-Central Province became Bas-Zaire Province. Kinshasa remains the name of the capital city.

Production of minerals remained an important part of the Zaire economy, providing approximately 80 percent, by value, of the nation's exports and 45 percent of government revenues. Copper, cobalt, zinc, and associated metals produced in Shaba dominated the mineral output, accounting for about 87 percent of the value of 1970 exports of mineral products. Most of the remaining mineral exports were diamond, tin, and manganese. Zaire continued to be the largest producer of cobalt and industrial diamond in the world and was the fifth ranked country in the production of copper. Developments were in progress to substantially expand productive capability for copper and associated metals in Shaba Province. The Government was also making a determined effort to encourage output in other mineral producing sectors.

PRODUCTION AND TRADE

Production of copper continued an upward trend, increasing 5.5 percent to a record 407,000 tons. Other important mineral commodities with increases were cobalt (8.6 percent); zinc (14.2 percent); gold (1.1 percent); silver (5.3 percent); and manganese (11.5 percent). Output of diamond and smelter tin decreased 2.7 and 3.2 percent, respectively. Details of mineral production are shown in table 1 and available trade data in tables 2 and 3.

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[1] Physical scientist, Division of Nonferrous Metals.

Table 1.—Zaire: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971 [p]
METALS			
Beryllium, beryl concentrate, gross weight	[r] 145	130	76
Cadmium smelter production	[r] 300	317	260
Cobalt:			
Mine output, metal content	10,596	13,958	13,426
Refinery production	10,596	13,374	14,518
Columbium-tantalum concentrate	[r] 174	146	114
Copper:			
Mine output, metal content	356,906	385,679	407,000
Blister and leach cathodes	363,758	385,543	403,426
Refined	182,291	189,600	200,000
Germanium, content of concentrates ... kilograms	11,325	21,205	53,133
Gold ... troy ounces	175,804	177,128	179,079
Manganese ore and concentrate, gross weight	311,429	346,950	387,000
Rare-earth metals, monazite concentrate, gross weight	178	143	217
Silver ... thousand troy ounces	1,896	1,709	1,800
Tin:			
Mine output, metal content ... long tons	6,542	6,345	[e] 6,400
Smelter, primary ... do	1,851	1,374	[e] 1,330
Tungsten mine output, metal content	[r] 65	--	--
Zinc:			
Mine output, metal content	94,558	105,082	120,000
Metal, primary	63,732	63,750	63,600
NONMETALS			
Cement, hydraulic ... thousand tons	322	355	[e] 360
Diamond:			
Gem ... thousand carats	[r] 1,802	1,649	[e] 1,700
Industrial ... do	[r] 11,621	12,438	[e] 12,000
Total ... do	[r] 13,423	14,087	[e] 13,700
MINERAL FUELS AND RELATED MATERIALS			
Coal, bituminous ... thousand tons	66	102	114
Petroleum refinery products:			
Gasoline ... thousand 42-gallon barrels	884	1,022	925
Kerosine and jet fuel ... do	573	572	553
Distillate fuel oil ... do	1,180	1,332	1,285
Residual fuel oil ... do	1,898	1,754	1,970
Other ... do	9	13	17
Refinery fuel and losses ... do	354	266	264
Total ... do	4,898	4,959	4,964

[e] Estimate. [p] Preliminary. [r] Revised.

Table 2.—Zaire: Apparent exports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum scrap	50	--	
Copper:			
Ore and concentrate	--	1,261	All to Belgium-Luxembourg.
Matte	460	75	Italy 50; France 25.
Metal:			
Scrap	399	491	West Germany 265; Belgium-Luxembourg 226.
Unwrought:			
Unrefined	2,444	6,757	France 6,537; Italy 220.
Refined	79,004	87,687	Italy 42,441; France 29,085; United Kingdom 4,560.
Unspecified (unrefined and/or refined)	245,725	277,822	Belgium-Luxembourg 264,722; Japan 13,100.
Semimanufactures	--	75	All to Italy.
Iron and steel scrap	5,146	5,573	Italy 3,799; Spain 1,774.
Manganese ore, gross weight	274,977	231,595	Belgium-Luxembourg 138,547; West Germany 47,442; United States 30,634.
Tin:			
Ore and concentrate, gross weight long tons	7,285	7,476	Belgium-Luxembourg 4,529; Netherlands 1,829; Spain 1,118.
Metal, unwrought do	1,777	1,371	All to Belgium-Luxembourg.
Tungsten ore and concentrate, gross weight	117	164	Belgium-Luxembourg 78; France 33; West Germany 33.
Uranium and thorium ores value, thousands	$142	$99	All to France.
Zinc:			
Ore and concentrate	72,679	37,303	All to Belgium-Luxembourg.
Metal:			
Unwrought	57,440	34,629	Belgium-Luxembourg 12,591; West Germany 8,501; Italy 4,997.
Worked	--	25	All to Italy.
Other:			
Ores and concentrates n.e.s. value, thousands	$1,286	$2,597	Belgium-Luxembourg $1,750; United States $803.
Metallurgical residues containing recoverable metals	722	1,006	West Germany 547; Belgium-Luxembourg 359; Netherlands 100.
Metals, nonferrous, n.e.s. unwrought and semimanufactures	[2] 14,953	17,261	Belgium-Luxembourg 13,137; Japan 3,544; West Germany 365.
NONMETALS			
Diamond:			
Gem value, thousands	$43,966	--	
Industrial do	$1,462	$1,172	Italy $888; United States $266.
Fertilizer manufactured, potassic	--	23,160	All to United States.
MINERAL FUELS AND RELATED MATERIALS			
Petroleum refinery products:			
Distillate fuel oil thousand 42-gallon barrels	150	--	
Residual fuel oil do	713	228	All to United Kingdom.

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[1] Compiled from import data of Australia, Austria, Belgium-Luxembourg, Canada, Denmark, Finland, France, West Germany, Greece, Iceland, Ireland, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United States, and Yugoslavia.

[2] Partial figure; quantity listed valued at $60,101,000; an additional unspecified quantity was reported in sources, which gave a value of $9,948,000 for the unreported quantity; by far the larger part of this total value for unspecified quantities was credited to the United States.

Source: Statistical Office of the United Nations. 1969 Supplement to the World Trade Annual. V. 3 (Africa), Walker and Company, New York, 1971, pp. 462–464; 1970 Supplement to the World Trade Annual. V. 3 (Africa), Walker and Company, New York, 1972, pp. 209–211.

Table 3.—Zaire: Apparent imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum metal and alloys, all forms	524	1,067	Belgium-Luxembourg 574; Norway 266.
Copper metal and alloys, all forms	247	323	Belgium-Luxembourg 223; Yugoslavia 100.
Iron and steel:			
Pig iron and ferroalloys	200	412	All from West Germany.
Primary forms	--	574	Italy 410; Belgium-Luxembourg 164.
Semimanufactures:			
Bars, rods, angles, shapes, and sections	33,268	57,014	Belgium-Luxembourg 49,520; Japan 3,545; France 2,333.
Universals, plates, and sheets	38,475	53,260	Belgium-Luxembourg 28,462; Japan 12,332; Austria 5,305.
Hoop and strip	1,617	2,949	Belgium-Luxembourg 1,363; West Germany 1,082; France 504.
Rails and accessories	9,293	7,891	Belgium-Luxembourg 4,084; France 3,005; United Kingdom 561.
Wire	1,624	2,202	Belgium-Luxembourg 1,998; West Germany 204.
Tubes, pipes, and fittings	7,413	13,072	Belgium-Luxembourg 4,290; Japan 3,822; France 1,171.
Castings, rough	732	759	Italy 241; Belgium-Luxembourg 239; United States 230.
Total	92,422	137,147	
Lead metal and alloys, all forms	126	166	All from Belgium-Luxembourg.
Silver, crude and partly worked value, thousands	$61	$174	Belgium-Luxembourg $107; Switzerland $67.
Tin metal and alloys, all forms long tons	15	--	
Titanium oxide	334	649	All from Belgium-Luxembourg.
Zinc metal and alloys, all forms	73	81	Do.
Other metals and alloys n.e.s., all forms	--	28	Do.
NONMETALS			
Asbestos	794	936	All from Canada.
Barite and witherite	--	620	All from France.
Cement, hydraulic	2,068	9,710	Denmark 7,700; Belgium-Luxembourg 2,010.
Clay products:			
Nonrefractory	2,317	3,775	Italy 2,070; Belgium-Luxembourg 871; West Germany 834.
Refractory	1,641	1,500	Belgium-Luxembourg 994; Austria 367; West Germany 139.
Diatomaceous earth	330	548	All from United States.
Fertilizer materials manufactured:			
Nitrogenous	8,090	8,627	France 3,642; Belgium-Luxembourg 3,100; West Germany 1,885.
Potassic	3,565	--	
Mixed and unspecified	4,020	3,914	Belgium-Luxembourg 2,532; Italy 703; West Germany 578.
Gypsum and plasters	7,500	15,700	All from France.
Lime	1,587	1,679	All from Belgium-Luxembourg.
Pigments, mineral, iron oxides	141	--	
Salt	432	--	
Slag and other nonmetal bearing metallurgical residues	150	--	
MINERAL FUELS AND RELATED MATERIALS			
Coal, coke and briquets	9,337	32,084	Belgium-Luxembourg 27,273; United States 2,766; France 2,045.
Petroleum:			
Crude thousand 42-gallon barrels	--	261	All from United Kingdom.
Refinery products:			
Kerosine and jet fuel do	5	12	All from Netherlands.
Distillate fuel oil do	57	--	
Lubricants do	25	38	Belgium-Luxembourg 35; United Kingdom 1.
Other do	64	94	Spain 70; Netherlands 15; Belgium-Luxembourg 9.
Total do	151	144	

[1] Compiled from export data of Australia, Austria, Belgium-Luxembourg, Canada, Denmark, Finland, France, West Germany, Greece, Iceland, Ireland, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom, the United States, and Yugoslavia.

Source: Statistical Office of the United Nations. 1969 Supplement to the World Trade Annual. V. 3 (Africa), Walker and Company, New York, 1971, pp. 465–478; 1970 Supplement to the World Trade Annual. V. 3 (Africa), Walker and Company, New York, 1972, pp. 212–229.

COMMODITY REVIEW

METALS

Cobalt, Copper, Zinc, and Associated Metals.—All of the copper, cobalt, and zinc production was from mines in Shaba operated by the nationalized company, La Générale des Carrières et des Mines du Zaire (Gécamines), formerly La Générale Congolaise des Mines (GÉCOMINES). The structure of the Gécamines complex includes the open pit mines of Musoshi, Kamoto, and Ruwe, and the underground mine at Kamoto in the western group; the M'Sesa and Karanda open pit mines and the Kambove-West underground mine in the central group; and the Kipushi underground mine in the southern group. There are associated concentrators at the mine groupings and metallurgical plants at Lubumbashi, Shituru, and Karanda. Cobalt production derives principally from the western group of mines and zinc with associated cadmium and germanium output from the Kipushi mine. Byproduct gold and silver are recovered during metallurgical processing of the concentrates.

Gécamines is in the midst of a 5-year development program designed to progressively increase copper production to 460,000 tons in 1976, to 560,000 tons in 1978, and to 600,000 tons in 1980. The program calls for investing $100 million, two-thirds to be financed by the company and one-third to come from abroad, mainly by the Export-Import Bank and the European Investment Bank.

Société de Dévelopement Industrial et Miniere du Zaire (Sodimiza), formerly SODIMICO, a joint Zaire-Japanese consortium, was developing mines at Mososhi and Tshinsenda in Shaba Province and had plans for a third mine. Ore reserves are estimated to be 100 million tons of 3.5 percent copper at Musoshi and 35 million tons of 5.5 percent copper at Tshinsenda.

Shafts and underground development at Musoshi will reach the stage where initial output is anticipated in July 1972, with the rated annual capacity of 50,000 tons to be attained in October. Plans call for an increase to 60,000 tons per year at Musoshi and initiation of output at the same rate at Tshinsenda during 1976. At that time Sodimiza, according to its agreement with the Zaire Government, will study the feasibility of building refining facilities.

Société Minière de Tenuke-Fungurume (SMTF), formerly SOCOTEF and Société Internationale des Mines du Zaire (SIMZ), formerly SIMICO were created in 1970 by signature of a convention between the Zaire Government and an international consortium of five companies. Ownership of SMTF and SIMZ is as follows: The Zaire Government (20 percent); Amoco Minerals Co. (28 percent); Charter Consolidated Ltd., of London, (28 percent); Mitsui & Co. Ltd. (14 percent); Omnimines, which recently replaced Bureau de Recherches Géologiques et Minières (BRGM), of Paris, (7 percent); and Leon Tempelsman & Son, Inc., of New York, (3 percent).

SMTF was conducting extensive exploration in the Tenke-Fungurume district of Shaba. Results have been quite favorable, with the discovery of substantial reserves of copper-cobalt ore. Plans are to construct a mining-milling-refining complex with the related infrastructure costing approximately $300 million for production in late 1976 at an annual rate of 150,000 tons of copper. SIMZ had exploration concessions in five zones totaling 30,700 square kilometers. One-half of this area was recently returned to the Zaire Government and in accordance with the convention, two-thirds of the remaining area must be returned in September 1973. Exploration rights on the final 5,000 square kilometers expires after 5 years, but is renewable.

All of the copper expansion plans in Shaba are contingent on the availability of electrical power. A shortage seems likely in 1976 unless additional power can be brought to Shaba from the second stage of the Inga dam and power station on the lower Zaire River. Feasibility studies are being made to determine whether a power transmission line from Bas Zaire to Shaba can be built.

Falconbridge Nickel Co. of Canada was investigating the feasibility of mining two copper deposits in eastern Shaba near the town of Pweto. These deposits are controlled by Enterprises Minières Zairoises (EMZ).

Columbium-Tantalum, Gold, Tin, and Tungsten.—Syndicat Minière de l'Etain (SYMETAIN) is Zaire's largest producer of tin and a major producer of tungsten. There are two major production areas, Kalima and Punia, both in the Maniema district of Kivu. Tin production consisted of 3,200 tons of cassiterite concentrate containing about 75 percent tin. The concentrate is obtained by crushing, screening, and washing the ore which yields about 2 kilograms of product per ton of material treated.

Cobelmin-Zaire, a subsidiary of Compagnie Belge d'Enterprises Minières, operates concessions owned by Compagnie Minière des Grands Lacs (MGL), Kinoretain, Kindamines, Minerga, and Miluba. Cobelmin's production from mines in Kivu Province included 1,278 kilograms of gold, 2,234 tons of tin concentrate, and quantities of columbium-tantalum and tungsten concentrates.

Philips Brothers Sobaki (Phibraki) operated properties at Kabili, Kivu Province, and produced 93 tons of concentrate from a mixed cassiterite-columbium-tantalum ore. Société Minière Union Carbide-Somikubi (SOMUCAR) completed construction of a plant in 1970 for treatment of a columbium-tantalum ore (pyrochlore) at Bingo in Kivu Province. However, technical difficulties, high transportation cost, and a low market price caused abandonment of the project. Somikubi, owned by Kivumines and MGL, produced 99 tons of tin concentrate.

In Shaba Province, Zaire-Etain, owned equally by the Government and Compagnie Géologique et Minière des Ingénieurs et Industriels Belges (GÉOMINES), produced 1,393 tons of tin and 65 tons of byproduct columbium-tantalum. The ore is mined from four open pits near Manono, concentrated, and then converted to metal in Zaire's only tin smelter.

Manganese.—Société Minière de Kisenge (SMK), a Zaire company owned wholly by Société Générale de Belgique, was the only producer of manganese. Under the terms of SMK's charter with the Zaire Government, the Government holds 50 percent of the voting rights and receives 60 percent of the profits. The company operated two open pit mines at Kisenge near the Angola border. Most of the ore, which averages 47 percent manganese, is upgraded for shipment to 50 percent manganese by simple crushing and washing. However, about one-fourth of the crushed ore in the form of fines is shipped without washing. Operation of the existing concentrator, which would permit mining lower grade ore with subsequent concentration to a 90 percent manganese product, is considered to be uneconomic.

NONMETALS

Cement.—Ciments et Materiaux de Construction du Shaba (Cimshaba) began a modernization and expansion program at their Labudi, Shaba Province, cement plant. The project will cost more than $2 million and will include improved coal processing facilities and a change from wet to dry processing. Annual production capacity will increase from the original 90,000 tons to 120,000 in 1971 and 150,000 in 1973.

Société des Ciments du Congo (CICO) has been operating at maximum capacity of 322,000 tons per year. The estimates are that demand exceeds output by 100,000 tons per year. CICO has obtained a $2.25 million loan from the European Development Fund for an expansion program to increase capacity to 600,000 tons, scheduled for completion in 1972.

A German firm, Klochner-Industrie-Anlagen, started construction of a cement plant in Bas-Zaire Province. A final capacity of 1.5 million tons per year is anticipated for 1976.

Diamond.—Production of diamond declined 2.7 percent to 13.7 million carats. Most of the output was as industrial diamond in Lubilash by Société Minière de Bakwanga (MIBA). Diamond of gem stone quality was obtained from alluvial deposits in the Kasai field.

MINERAL FUELS

Coal.—La Société des Charbonnages de la Luena operates a colliery about 45 miles northwest of Lubudi in southwest Shaba. Since Luena coal is soft and not satisfactory for coking, the colliery operates at only a fraction of its capacity even though Zaire imports coal from the Wankie mines in Southern Rhodesia. Production in 1971 increased 12 percent to 114,000 tons, well below peak production of 456,000 tons in 1955. Coal from Luena is sold to the KDL Railroad, Gécamines, and Cimshaba.

Petroleum.—Société Zaire-Italienne de Raffinage operates an oil refinery at Kinlao near the mouth of the Zaire River. The plant processed 678,500 tons of imported crude oil to produce motor gasoline, jet fuel, distillate fuel oil, and residual fuel oil.

In late 1970, Société du Littoral Congolais (SOLICO) and a Zaire affiliate of Gulf Oil Co. (CONGOCO), reported test production at a rate of 1,800 barrels per day from a discovery oil well drilled 10 miles offshore. No further results of this exploration have been announced. Société Congolaise de Recherche Petrolière (SOCOREP), acting for Mobil Oil Co., Shell Oil Co., and the Belgian Fina group, has also been active in offshore oil exploration.

The Mineral Industry of Zambia

By Gertrude N. Greenspoon[1]

Production of copper, the predominant commodity in the Zambian mineral industry, did not regain the level existing prior to disruption of operations at the Mufulira mine in September 1970. The reduced output together with lower copper prices resulted in a drop in value to $620 million from $908 million[2] in 1970. The copper industry, however, continued as the main provider of government revenue. Since 1965, copper has accounted for over 90 percent of total export values.

Although the first national development plan was to end in 1970, it was extended until the end of 1971. The extension provided time to assess Zambia's past economic reforms. The second national development plan, effective January 1972 to December 1976, will give priority to rural development.

Mindeco, Ltd., a State corporation operating under the Ministry of Mines and Mining Development, which had acquired 51 percent interests in the copper, lead, and zinc mines, was planning expansions in the small mines sector. These included an emerald deposit near Kalulushi and a tin mining cooperative in the Choma district.

The Metal Fabricators of Zambia (ZAMEFA) manufacturing plant at Luanshya began operations in February. The company will supply about 80 percent of Zambia's demand for finished and semifinished products. The remainder of demand, consisting of highly specialized products, will continue to be imported.

By yearend the Export Import Bank (EXIM) was considering requests for expansions in the Zambian copper industry. A Nchanga Consolidated Copper Mines, Ltd. (NCCM) loan would approximate $30 million, and that of Roan Consolidated Mines, Ltd. (RCM) about $20 million. Both loans would cover purchase of U.S. goods and services for expansion of mining and processing facilities. Financial arrangements for each would be 10 percent cash payment, 45 percent EXIM direct credit, and 45 percent commercial bank credit with EXIM guarantee or repayment. Proposed repayment terms would be 10 years beginning in early 1974.

The 1,100-mile Tan Zam Railway scheduled for completion in 1975 was about a year ahead of schedule. Work was begun from the port of Dar es Salaam, Tanzania, on the Indian Ocean and was nearing the Zambia border by yearend 1971.

Difficulties experienced in obtaining generators, transformers, and other equipment for the Kafue hydroelectric plant increased costs from $193 million to $202 million. Construction of the project was proceeding steadily.

PRODUCTION

The value of mineral production totaled $659 million in 1971, a 30-percent decrease from 1970, and was the lowest since 1965. Output of blister and anode copper and electrolytic copper dropped 6 and 8 percent, respectively, reflecting limited activity at the Mufulira mine. A 7-percent increase was recorded in electrolytic zinc production, and a small gain was made in refined lead output. Coal production rose 30 percent to a record high.

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[1] Mineral specialist, Division of Nonferrous Metals.

[2] Where necessary, values have been converted from the Zambian currency kwacha to U.S. dollars at the rate of K1.00=US$1.40.

Table 1.—Zambia: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971 [p]
METALS			
Cadmium metal	6	12	10
Cobalt:			
Mine output, metal content	1,812	2,400	2,080
Metal	1,798	2,052	1,886
Copper: [1]			
Mine output, copper content	719,467	684,064	651,396
Blister and anodes, copper content	703,692	682,820	643,674
Refined	603,199	580,722	534,339
Gold [2] [e] ... troy ounces	5,000	[r] 4,800	4,400
Lead: [1]			
Mine output, lead content	22,900	32,900	30,800
Smelter (refined)	23,007	[r] 27,300	27,700
Manganese ore, gross weight	25,659	--	--
Selenium [3] [e] ... kilograms	26,000	[r] 25,000	23,000
Silver [4] [e] ... thousand troy ounces	768	[r] 740	680
Zinc: [1]			
Mine output, zinc content	68,200	65,800	68,700
Smelter (electrolytic)	50,165	[r] 53,500	57,000
NONMETALS			
Amethyst ... kilograms	114,172	35,172	93,417
Cement, hydraulic ... thousand tons	[r] 331	[r] 377	[e] 470
Gypsum	1,200	([5])	--
Lime, hydraulic and quick ... thousand tons	[r] 75	104	[e] 104
Stone:			
Limestone	772,291	741,193	[e] 800,000
Phyllite	63,093	56,171	73,291
Talc	2,290	--	713
MINERAL FUELS AND RELATED MATERIALS			
Coal, bituminous ... thousand tons	397	[r] 623	812

[e] Estimate. [p] Preliminary. [r] Revised.

[1] Data on copper, lead, and zinc are reported under somewhat different headings than in previous editions of this chapter in order to conform with general style guidelines for this volume of the Minerals Yearbook.

[2] Chiefly contained in blister copper, refinery muds, and electrolytic copper.

[3] Contained in blister copper, refinery muds, and electrolytic copper.

[4] Refined silver and silver contained in blister copper, refinery muds, and electrolytic copper.

[5] Revised to none.

TRADE

The value of mineral exports from Zambia in 1970 was $985 million, 98 percent of total commodity exports. Copper continued as the principal export, accounting for 97 percent of the mineral commodities exported and 95 percent of all exports. Japan displaced the United Kingdom as Zambia's major market.

Imports in 1970 were valued at $502 million, 15 percent more than in 1969 and a record high. Mineral commodities accounted for $65 million. Despite completion of the petroleum products pipeline and production of indigenous coal, Zambia imported mineral fuels in 1970 valued at $54 million.

The value of mineral trade and total trade was as follows in million dollars:

	Mineral commodity trade	Total commodity trade
Exports:		
1968	744.2	762.2
1969	1,046.5	1,073.1
1970	984.6	1,000.7
Imports:		
1968	52.6	455.3
1969	56.1	436.5
1970	64.8	501.9

Trade missions to and from Zambia were much in evidence during 1971. On June 21, the Mineral and Metals Trading Corp. of India announced that a 3-year trade agreement was signed with Zambia. The agreement called for the purchase by India of 18,000 tons of copper annually.

Also in June, Mindeco, Ltd., said Zambia would sell 1,000 tons of copper monthly to the People's Republic of China. The contract was signed in Peiping by a negotiating team from RCM with the China National Metals & Minerals Import & Export Corp. Shipments would be from Dar es Salaam beginning in August. A trade agreement with the U.S.S.R. was signed on December 17. The agreement reportedly set forth the basic principles on which trade between the two countries will be carried out and established the lists of goods to be traded. Among the items to be imported by Zambia are mining equipment, chemical fertilizers, and rolled steel. The U.S.S.R. will import copper and copper products, lead, and zinc.

Table 2.—Zambia: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Cadmium metal	[r]9	31	Republic of South Africa 30; Southern Rhodesia 1.
Cobalt metal	1,588	1,814	United Kingdom 1,640; Japan 100; Australia 58.
Copper metal including alloys:			
Sludge	882	651	Japan 448; West Germany 126; Belgium 77.
Slimes	681	815	West Germany 384; Sweden 345; Japan 86.
Unwrought, crude:			
Anodes	3,190	736	Austria 652; Italy 84.
Blister	107,124	103,226	Japan 55,264; West Germany 20,438; United Kingdom 13,469.
Refined:			
Wire bars	584,288	543,998	United Kingdom 129,986; Japan 97,739; Italy 73,637; West Germany 60,684.
Cathode form	33,169	33,628	Japan 12,167; United Kingdom 10,824; West Germany 3,182.
Ingots and bars	923	990	Japan 588; Belgium 319; West Germany 83.
Iron and steel semimanufactures	--	(1)	
Lead:			
Unwrought	25,891	22,065	Republic of South Africa 9,366; Italy 3,527; Arab Republic of Egypt 3,277; Iran 2,561.
Semimanufactures	(1)	16	All to Southern Rhodesia.
Silver unworked troy ounces	49,163	97,491	Republic of South Africa 97,491.
Zinc:			
Unwrought	53,586	50,343	Republic of South Africa 15,037; Greece 5,265; Italy 5,104; Yugoslavia 3,999.
Semimanufactures	--	(1)	
NONMETALS			
Abrasives, natural, precious and semiprecious stones kilograms	27,573	--	
Cement	202	5,475	Zaire 5,315; Tanzania 160.
Lime	--	65	All to Zaire.
Precious and semiprecious stones, except diamond value, dollars	$593,765	$697,728	Hong Kong $422,129; West Germany $217,200; Netherlands $26,173.
Talc	984	358	Republic of South Africa 308; United Kingdom 49.

[r] Revised.

(1) Less than ½ unit.

Table 3.—Zambia: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum semimanufactures	517	601	Republic of South Africa 181; Tanzania 116; United Kingdom 77.
Antimony:			
Powder including tellurium powder	2	--	
Ingots and bar	29	--	
Arsenic acid	12	--	
Chromium ore and concentrate	1,960	595	All from Republic of South Africa.

Table 3.—Zambia: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS—Continued			
Cobalt metal including alloys, all forms	5	--	
Copper:			
Copper sulfate	[r]310	5	Republic of South Africa 5.
Metal including alloys, all forms	419	862	Republic of South Africa 339; United Kingdom 181; Zaire 177.
Iron and steel:			
Ore and concentrate	38	29,379	Republic of South Africa 29,070; France 309.
Pig iron, sponge iron and ferroalloys	3,766	3,314	Republic of South Africa 3,274; France 22; Sweden 14.
Ingots and other primary forms	11	113	Republic of South Africa 59; Japan 52.
Semimanufactures	119,074	86,236	Republic of South Africa 43,083; Japan 15,239; United Kingdom 11,697.
Lead:			
Oxides	15	85	United Kingdom 71; Republic of South Africa 13.
Metal unwrought and semimanufactures including alloys	[r]36	44	Republic of South Africa 19; United Kingdom 8.
Mercury 76-pound flasks	12	8	All from United Kingdom.
Nickel metal including alloys	NA	14	Switzerland 6; Republic of South Africa 5.
Platinum-group metals, metals including alloys, all forms troy ounces	NA	889	United Kingdom 849; Republic of South Africa 40.
Silver metal including alloys do	NA	15,373	Republic of South Africa 14,433; United Kingdom 844.
Tellurium elemental	NA	145	All from Republic of South Africa.
Tin metal including alloys long tons	85	65	Republic of South Africa 33; United Kingdom 21.
Titanium oxide	301	594	Republic of South Africa 400; West Germany 126; Norway 60.
Zinc:			
Oxides	19	NA	
Metal including alloys	8	6	Belgium 2; United Kingdom 2; Republic of South Africa 1.
Other:			
Ore and concentrates of base metals n.e.s.	51	78	All from Republic of South Africa.
Ash and residue containing nonferrous metals	1	20	Do.
Metals including alloys, all forms	37	120	Republic of South Africa 82; Japan 24; Zaire 12.
NONMETALS			
Abrasives:			
Pumice, emery, natural corundum, etc.	6	16	West Germany 10; Republic of South Africa 5.
Grinding and polishing wheels and stones	125	[1]$280,519	Republic of South Africa $230,418; West Germany $13,931; United Kingdom $12,270.
Other, crude	32	1	Republic of South Africa 1.
Asbestos	--	15,607	Republic of South Africa 15,585; Italy 21.
Barite	146	112	Republic of South Africa 68; West Germany 24; France 20.
Boron materials:			
Crude, natural borates	9	105	Republic of South Africa 105.
Oxide and acid	NA	9	Republic of South Africa 6; Netherlands 2.
Bromine kilograms	1,246	--	
Cement	9,005	917	United Kingdom 433; Denmark 243; Republic of South Africa 207.
Chalk	NA	391	United Kingdom 304; West Germany 44.
Clays and products (including all refractory bricks):			
Crude n.e.s.:			
Fire	569	283	United States 200; Republic of South Africa 74.
Fuller's earth, dinas, chamotte	177	100	United Kingdom 89; Republic of South Africa 11.
Kaolin (china)	1,500	708	Republic of South Africa 391; United Kingdom 209; United States 91.
Other	NA	1,189	Republic of South Africa 1,090; United Kingdom 57; United States 41.
Products:			
Refractory (including nonclay bricks) value, thousand dollars	$1,568	$1,624	Republic of South Africa $766; United Kingdom $258.
Nonrefractory do	$173	$168	Republic of South Africa $85; United Kingdom $71.

See footnotes at end of table.

Table 3.—Zambia: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
NONMETALS—Continued			
Diatomite and other infusorial earths	286	804	Republic of South Africa 395; United States 376; Kenya 33.
Feldspar and fluorspar	NA	45	Republic of South Africa 38; Southern Rhodesia 7.
Fertilizer materials:			
Crude, phosphatic	NA	175	Republic of South Africa 95; United Kingdom 44.
Manufactured:			
Nitrogenous	54,340	31,743	Netherlands 15,231; Republic of South Africa 12,627; France 2,471.
Phosphatic		4,188	Republic of South Africa 4,095; Netherlands 91.
Potassic		3	Republic of South Africa 1; United Kingdom 1; West Germany 1.
Other including mixed		1	United Kingdom 1.
Ammonia, anhydrous	57	1,245	Republic of South Africa 640; Southern Rhodesia 586; West Germany 18.
Graphite, natural	34	6	United Kingdom 6.
Gypsum and plasters	19,099	11,822	Republic of South Africa 11,663.
Lime (building)	397	NA	
Magnesite including magnesium carbonate	74,917	286	Republic of South Africa 269; United Kingdom 17.
Mica, all forms	3	30	Republic of South Africa 23.
Pigments, mineral:			
Natural crude	10	26	Republic of South Africa 20; West Germany 6.
Iron oxides, processed	146	311	United Kingdom 223; Republic of South Africa 63.
Precious and semiprecious stones, except diamond ... value, thousand dollars	r $88	$26	Zaire $17; Republic of South Africa $3.
Pyrite (gross weight)	22	--	
Salt	45,346	13,186	United Kingdom 4,794; Angola 4,130; Mozambique 2,598.
Sodium and potassium compounds n.e.s.:			
Caustic soda	3,146	2,163	United States 645; Italy 500; West Germany 257; Japan 202.
Caustic potash, sodic and potassic peroxide	20	22	Norway 16; Czechoslovakia 3.
Stone, sand and gravel:			
Dimension stone	210	101	Republic of South Africa 81; Kenya 19.
Dolomite, chiefly refractory grade	NA	2,500	All from Sweden.
Gravel and crushed rock	NA	75	Republic of South Africa 44; United Kingdom 31.
Limestone (except dimension)	1,311	26	All from Republic of South Africa.
Sand excluding metal bearing	88	196	Republic of South Africa 147; United Kingdom 49.
Sulfur:			
Elemental, all forms	63	53	Republic of South Africa 27; United Kingdom 26.
Sulfuric acid	6,242	268	Republic of South Africa 143; Israel 80; Southern Rhodesia 18.
Talc, steatite, soapstone, and pyrophyllite	57	7	United States 5; Norway 2.
Vermiculite	8	10	All from Republic of South Africa.
Other nonmetals n.e.s.:			
Crude	NA	203	Republic of South Africa 152; Australia 50.
Slag, dross and similar waste, not metal bearing	NA	105	All from United Kingdom.
Oxides and hydroxides n.e.s	392	2,179	France 1,005; Republic of South Africa 543.
Building materials of asphalt, asbestos and fiber cement and unfired nonmetals n.e.s	NA	3,091	Republic of South Africa 2,539; Singapore 282; Belgium 210; United Kingdom 55.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black and gas carbon	393	NA	
Coal and coke including briquets	760,808	364,921	Southern Rhodesia 352,859; United Kingdom 11,569.
Gas, hydrocarbon	2,355	527	Republic of South Africa 262; Tanzania 262; France 3.
Petroleum:			
Crude and partly refined ... 42-gallon barrels	63	--	
Refinery products:			
Gasoline ... thousand 42-gallon barrels	1,112	1,145	Iran 1,095; Tanzania 39.
Kerosine ... do	65	83	Iran 46; Tanzania 33; Saudi Arabia 3.

See footnotes at end of table.

Table 3.—Zambia: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Refinery products—Continued			
Jet fuel thousand 42-gallon barrels..	159	276	Tanzania 246; Iran 29.
Distillate fuel oil..........do....	1,585	1,620	Iran 1,540; Tanzania 61; Saudi Arabia 19.
Residual fuel oil..........do....	107	18	Kenya 18.
Lubricants..........do....	159	162	United Kingdom 81; Kenya 40; Republic of South Africa 14; United States 12.
Mineral jelly and wax......do....	[2]24	20	Indonesia 6; United States 4; Singapore 3.
Other:			
Pitch and pitch coke 42-gallon barrels..	28,320	132	United States 105; Republic of South Africa 7.
Petroleum coke........do....		10,236	Iran 7,849; Tanzania 1,865.
Bituminous mixtures n.e.s. do....		27,845	Kenya 19,701; Netherlands 1,545; United Kingdom 1,436.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals value, dollars..	$15,480	$112,801	Kenya $93,600; United Kingdom $13,437; Republic of South Africa $1,859.

[r] Revised. NA Not available.
[1] Tonnage not reported.
[2] Previously reported in metric tons.

COMMODITY REVIEW

METALS

Cobalt.—At the Rokana division of NCCM, 2,600 tons of cobalt was produced in the 15-month period ended March 31, 1971. Construction of a new cobalt flotation circuit which will improve recovery and grade was nearly completed. In February, RCM acquired the Baluba property northwest of Luanshya. The Baluba project will be operated as part of the Luanshya division and was expected to be in production by the second half of 1973. The Baluba ore contains an estimated 0.17 percent cobalt. Concentrate will be sent to the Chambishi division for the production of cobalt hydroxide.

Copper.—Zambian copper production in 1971 was the lowest since 1966 as activities related to restoring full output at Mufulira continued. Partial production at Mufulira, begun in November 1970, attained a monthly rate of 6,000 tons by June 1971 but was 10,000 tons per month less than output planned prior to the accident on September 25, 1970.

The expansion program in the copper industry announced in 1970 continued, although it may not be possible to meet the original completion date of 1974. Two concentrators were completed and in operation, the Kalengwa in March and the Bwana Mkubwa in May. The leach-precipitation plant at Chingola was not completed in mid-1971 as scheduled, owing to delay in delivery of materials and equipment.

RCM produced 250,400 tons of refined copper in the year ended June 30, 1971, compared with 342,700 tons in the same period of 1970. Production at Mufulira continued to be affected by the cave-in on September 25, 1970, and total output by RCM was the lowest since the year ended June 30, 1967.

The Ndola Copper Refinery produced 119,400 tons of cathodes, and casting plant production of refinery shapes totaled 132,100 tons.

Ore production at Mufulira totaled 3.75 million tons averaging 2.20 percent copper (7.49 million tons and 2.51 percent in 1970). Smelter production, including concentrates and smelting ore from other RCM mines, was 128,900 tons of anodes (175,900 in 1970). Refined copper output was 84,400 tons, compared with 173,700 tons in 1970.

The Luanshya division produced a record 6.55 million tons in 1971. The smelter produced 110,500 tons of anodes, and refined copper output was 101,700 tons. The Luanshya division was expanded by the acquisition in February of the Baluba Mines, Ltd., property. Production at Baluba is planned to begin in 1973 with an annual rate of 22,000 tons by the second half of the year. Total output at Luanshya will be increased to nearly 120,000 tons annually. The concentrator was being expanded to handle the Baluba ore, but existing smelter capacity will be sufficient to treat the concentrates.

At Chibuluma, 659,700 tons of ore averaging 4.01 percent copper and 0.20 percent cobalt was produced. Refined copper production totaled 23,900 tons, and cobalt hydroxide containing 922 tons of cobalt was sold to the Rokana division of NCCM. A total of 1.66 million tons of ore was produced at Chambishi, and output of refined copper totaled 30,000 tons. Expansion of underground mining to increase output to 48,000 tons of copper annually in 1973 at Chambishi continued during the year. The open pit mine at Kalengwa produced 116,300 tons of ore and 10,400 tons of refined copper. The 600-ton-per-day concentrator began operations in March, and by yearend most sections of the plant were operating satisfactorily. Ore and concentrate were smelted at Mufulira and Luanshya.

Ore reserve data for the RCM group at the end of June 1971 were as follows:

Mine	Thousand metric tons	Copper (percent)
Mufulira	132,500	3.16
Luanshya (includes Baluba)	130,300	2.71
Chambishi	39,900	2.93
Chibuluma	6,000	4.81
Kalengwa	1,600	8.53

Copper operations of NCCM, comprising Rokana, Chingola, and Konkola divisions, produced 494,800 tons of refined copper in the 15-month period ended March 31, 1971. A total of 6.7 million tons of ore was produced by the Rokana division, of which 56 percent was from the Mindola ore body. Smelter output was 368,000 tons, and refinery production totaled 364,500 tons.

At the Chingola division, 12.0 million tons of ore was produced; 3.4 million tons was from the Lower and Upper underground mines and 8.6 million from open pit operations (Nchanga, River Lode, Chingola, and Fitula). The Chingola concentrator treated 10.1 million tons, and 1.9 million tons was sent to the Konkola concentrator. In addition, the Konkola concentrator treated 2.3 million tons of ore from the Konkola division mining operations which yielded 61,900 tons of copper contained in concentrates.

The Bwana Mkubwa concentrator of the Rokana division began operations in May, and output was proceeding at the planned 15,000-ton-per-year rate. Slow delivery of materials and equipment delayed completion of the leach-precipitation plant at Chingola, and operations were rescheduled for late in the year. The solvent extraction-ion exchange process plant scheduled for 1973 would not be operable until early 1974. Although reopening of the Kansanshi mine was planned for 1973, production of copper would not begin until installation of the solvent extraction plant. Plans for the Torco process plant to treat Kansanshi ore were abandoned because of the substantial increase in the estimated cost of the plant.

Ore reserve data for the NCCM group were as follows:

Mine	Thousand metric tons	Copper (percent)
Chingola	234,900	3.91
Nkana	124,600	2.55
Bancroft	94,100	3.53
Kansanshi	6,500	3.44
Bwana Mkubwa	5,600	3.31

Lead and Zinc.—On January 1, 1971, the Broken Hill mine became the Broken Hill division of NCCM. Operations for this division reflect activities for the first 3 months of 1971. In this period, 7,400 tons of refined lead and 13,400 tons of zinc (7,600 tons from the Imperial Smelting Furnace and 5,800 tons from the electrolytic plant) were produced.

The flotation plant treated 30,700 tons of ore containing 10.6 percent lead and 29.2 percent zinc and produced 5,500 tons of lead concentrate, averaging 39.9 percent lead, and 6,200 tons of zinc concentrate, averaging 59.1 percent zinc. Proven reserves at the end of 1970 were 1.8 million tons averaging 23.7 percent zinc and 11.2 percent lead, and indicated reserves were 1.4 million tons containing 26.3 percent zinc and 10.7 percent lead.

A decision, dependent upon capital costs, is expected to be made soon on the installation of Waelz kilns to treat refractory materials from dumps and future mining operations. The kilns could extend the life of the mine from 12 to 20 years.

NONMETALS

Construction of the Nitrogen Chemicals Co. of Zambia, Ltd., fertilizer plant was completed and operations commenced in February.

The development of lime production in Zambia has grown with the copper industry. Virtually all requirements of the copper producers are furnished from local sources. Development of the lime industry began in the late 1930's with operations on the edge of the Itawa stream at Ndola and at Misundu. Limestone was railed to Misundu for burning, but the kilns were abandoned in 1962 when the present operations were begun. The massive limestone bed extends from the fringe of Ndola to the Republic of Zaire border. The high-grade material is suitable both as smelter flux rock and as a feed for the kilns producing lime. Two quarries are in operation—Mwatesi, where the limestone is suitable as a flux rock; and Fox Cut, where the limestone is compact and suitable for kilning. Rights of part of the vast limestone deposit were transferred to Chilanga Cement Co. Ltd., and a $17.4 million lime plant was completed in 1969. The company announced plans for expanding output by the construction of a second kiln at Ndola.

Mindeco, Ltd., Zambia's mining development corporation, announced that studies were underway to determine the possibility of reopening the gypsum mine at Lochinvar, 30 miles northwest of Monze. The mine was originally operated by Anglo-American Corp. with plans to produce at the rate of 10,000 tons per year. After production of about 1,000 tons per year for 3 years, the operation closed at the end of 1968. Zambia relies on imports of gypsum to meet its requirements, which are estimated at 15,000 tons per year, principally for the cement industry. It is hoped that reactivation of the mine will develop use of gypsum in other industries such as plaster and agriculture.

Feasibility studies to develop a phosphate operation at Kaluwe were also in progress.

MINERAL FUELS

Coal.—In June, the National Coal Board of Zambia was reincorporated as Maambe Collieries, Ltd., a 100-percent subsidiary of Mindeco. Despite a record output of 812,000 tons, supplies of coal were adversely affected by delayed rail deliveries from Maamba in early 1971. By midyear, the situation had improved and coal stocks and rail deliveries were satisfactory.

The Mineral Industry of the Islands of the Caribbean

By Staff, Bureau of Mines

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BAHAMAS [1]

Ocean Industries, Inc., a subsidiary of the Dillingham Corp. of Hawaii, continued to expand its aragonite (calcium carbonate) production facilities during 1971. In addition to the production figure shown in table 1, Ocean Industries dredged over 640,000 tons of aragonite for use in expanding the area of an artificial island named Ocean Cay. This island, located south of Bimini, is used as an aragonite storage and export terminal and will become a petroleum transshipment terminal upon completion of the necessary tanker handling and associated storage facilities under construction. Oil will be transported from the Persian Gulf to Ocean Cay via two 350,000-deadweight-ton tankers that Ocean Industries is having built. The oil will then be loaded aboard smaller tankers for delivery to a U.S. east coast refinery. Ocean Industries also hopes to eventually establish iron ore transshipment facilities on Ocean Cay.

Following several years of difficulties, operations of the Diamond Crystal Salt Co. marine salt production facilities on Long Island began to approach their anticipated level. Salt output from these facilities in 1971 totaled 200,000 tons, almost a fourfold increase over the previous annual production record. The company was planning the expansion of its facilities at yearend.

The Freeport refinery on Grand Bahama Island, owned by Bahamas Oil Refining Co. (BORCO), a subsidiary of New England Petroleum Corp. (65 percent) and Standard Oil Co. of California (35 percent), completed its first year of operation at approximately its design capacity of 250,000 barrels per day. This plant operated primarily for the purpose of supplying low-sulfur residual fuel oil to the east coast of the United States; lighter products output was shipped to Western Europe. Feedstock consisted primarily of almost sulfur-free Libyan and Nigerian crudes blended with higher sulfur crudes from the Persian Gulf area.

During August 1971, BORCO awarded a contract to an Italian firm for the expansion of the Freeport plant's crude oil distillation capacity to 450,000 barrels per day. This expansion is to be accomplished primarily by the addition of a third atmospheric distillation unit. At yearend, BORCO was also preparing specifications for bids on the construction of desulfurization facilities at Freeport. Plans involve the installation of a hydroisomax desulfurization unit capable of processing 60,000 barrels of oil per day.

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[1] Gordon W. Koelling, geographer, Division of Fossil Fuels.

Table 1.—Islands of the Caribbean: Production of mineral commodities

Area, commodity, and unit of measure [1]		1969	1970	1971 [p]
ANTIGUA [2]				
Petroleum refinery products: [3]				
Gasoline [e]	thousand 42-gallon barrels	595	468	NA
Jet fuel and kerosine [e]	do	465	504	NA
Distillate fuel oil	do	[r] 597	746	NA
Residual fuel oil	do	[r] 2,131	2,664	NA
Other, including refinery fuel and losses [e]	do	112	130	NA
Total	do	3,900	4,512	NA
Stone, crushed and broken	thousand cubic meters	NA	NA	29
BAHAMAS [2]				
Cement, hydraulic	thousand metric tons	813	833	831
Petroleum refinery products:				
Jet fuel	thousand 42-gallon barrels	--	4,100	10,228
Distillate fuel oil	do	--	3,200	10,242
Residual fuel oil	do	--	13,000	42,267
Other	do	--	3,700	10,913
Refinery fuel and losses	do	--	1,500	3,000
Total	do	--	25,500	76,650
Salt	thousand metric tons	680	621	1,213
Stone:				
Aragonite [4]	do	561	2,142	762
Limestone (for cement only)	do	1,068	990	NA
BARBADOS [2]				
Gas, natural:				
Gross production	million cubic feet	108	116	129
Marketed production	do	91	[e] 100	[e] 100
Petroleum refinery products:				
Gasoline	thousand 42-gallon barrels	246	268	301
Kerosine	do	105	89	92
Distillate fuel oil	do	281	305	219
Residual fuel oil	do	169	198	228
Other	do	35	27	34
Refinery fuel and losses	do	42	45	46
Total	do	878	932	920
CUBA [2] [5]				
Cement, hydraulic	thousand metric tons	780	[e] 800	[e] 850
Cobalt mine output, metal content [e]	metric tons	1,500	1,500	1,500
Copper mine output, metal content [e]	do	3,000	3,000	3,000
Iron and steel, crude steel [e]	thousand metric tons	55	55	55
Nickel:				
Content of oxide product [e]	metric tons	18,500	18,500	36,000
Content of sulfide product [e]	do	16,700	16,700	
Petroleum:				
Crude [e]	thousand 42-gallon barrels	821	800	785
Refinery products: [3]				
Gasoline [e]	do	8,845	9,095	NA
Jet fuel [e]	do	1,518	2,480	NA
Kerosine [e]	do	949		
Distillate fuel oil [e]	do	7,212	6,714	NA
Residual fuel oil [e]	do	16,513	14,652	NA
Liquefied petroleum gas [e]	do	1,329	696	NA
Other [e]	do		5,163	NA
Refinery fuel and losses [e]	do	1,594		
Total	do	37,960	38,800	NA
DOMINICA [2]				
Pumice used for aggregate	metric tons	55,983	61,690	[e] 62,000
DOMINICAN REPUBLIC [2]				
Aluminum, bauxite, dry equivalent, gross weight [6]	thousand metric tons	1,093	1,067	1,311
Cement, hydraulic	do	390	492	603
Copper mine output, metal content	do	477	425	[e] 450
Gypsum [e]	do	100	100	100
Nickel content of ferronickel product	metric tons	--	--	466
Salt	thousand metric tons	26	38	[e] 38
Stone, limestone (excluding that for cement)	do	NA	48	NA
GRENADA				
Sand and gravel	thousand cubic meters	19,267	27,524	NA
Stone, crushed and broken	do	59,558	72,351	NA

See footnotes at end of table.

Table 1.—Islands of the Caribbean: Production of mineral commodities—Continued

Area, commodity, and unit of measure [1]	1969	1970	1971 [p]
HAITI [2] [7]			
Aluminum, bauxite, dried, gross weight ... thousand metric tons	665	682	648
Cement, hydraulic ... do	[r] 55	65	72
Copper mine output, metal content ... metric tons	1,797	1,696	[e] 1,500
Gold mine output, metal content [e] ... troy ounces	3,000	3,000	3,000
Silver mine output, metal content [e] ... thousand troy ounces	17	17	17
JAMAICA			
Aluminum:			
Bauxite, dry equivalent of crude ore, gross weight thousand metric tons	10,499	12,009	12,767
Alumina (exports) ... do	1,155	1,689	1,812
Cement, hydraulic ... do	414	457	431
Clays for cement ... do	[e] 140	161	[e] 150
Gypsum ... metric tons	255,029	282,843	309,249
Lime ... do	NA	NA	137,000
Petroleum refinery products:			
Gasoline ... thousand 42-gallon barrels	1,988	2,248	1,247
Jet fuel ... do	834	549	1,319
Kerosine ... do	501	672	
Distillate fuel oil ... do	2,204	2,253	2,042
Residual fuel oil ... do	5,103	5,104	5,467
Other ... do	301	985	345
Refinery fuel and losses ... do	281	303	335
Total ... do	11,212	12,114	10,755
Sand and gravel:			
Sand:			
Glass ... thousand metric tons	12	15	14
Common [e] ... thousand cubic meters	904	NA	NA
Gravel ... do	68	NA	NA
Stone:			
Limestone for cement and lime ... thousand metric tons	NA	744	494
Marble ... metric tons	NA	NA	2,604
MARTINIQUE			
Clays ... thousand metric tons	50	NA	NA
Pumice ... do	18	[e] 18	[e] 18
Salt ... do	324	[e] 300	[e] 300
Sand ... do	46	NA	NA
Stone including gravel:			
Crushed and broken ... do	645	NA	NA
Other [8] ... do	159	NA	NA
NETHERLANDS ANTILLES [2]			
Fertilizer materials:			
Phosphatic, crude phosphate rock ... do	113	[e] 110	92
Nitrogenous, manufactured (sales) ... do	[e] 220	NA	NA
Petroleum refinery products:			
Gasoline, aviation ... thousand 42-gallon barrels	6,159	1,823	2,114
Gasoline, other ... do	35,496	30,130	27,964
Jet fuel ... do	21,590	14,662	12,877
Kerosine ... do	19,735	16,046	14,045
Distillate fuel oil ... do	27,532	27,857	25,208
Residual fuel oil ... do	170,716	200,160	159,545
Lubricants ... do	6,774	7,453	2,519
Other ... do	6,940	21,697	25,060
Refinery fuel and losses ... do	16,292	16,189	15,842
Total ... do	311,234	336,017	285,174
Stone, limestone ... metric tons	NA	NA	975
ST. LUCIA			
Sand and gravel [e] ... thousand metric tons	NA	70	NA
Stone, crushed [e] ... do	NA	520	NA
ST. VINCENT			
Sand ... metric tons	[e] 31,000	NA	NA
Stone, crushed ... do	[e] 25,000	NA	NA
TRINIDAD AND TOBAGO			
Asphalt, natural ... thousand cubic meters	124	132	NA
Cement, hydraulic ... do	243	271	259
Clays:			
Argillite ... do	79	181	NA
Other, unspecified ... do	62	[9] 29	NA
Fertilizer materials, manufactured nitrogenous ... thousand metric tons	624	605	NA

See footnotes at end of table.

Table 1.—Islands of the Caribbean: Production of mineral commodities—Continued

Area, commodity, and unit of measure [1]	1969	1970	1971 [p]
TRINIDAD AND TOBAGO—Continued			
Gas, natural:			
Gross production million cubic feet	137,508	121,060	109,814
Marketed production do	69,297	66,687	65,066
Gypsum metric tons	4,064	[e] 4,000	[e] 4,000
Natural gas liquids thousand 42-gallon barrels	158	168	NA
Petroleum:			
Crude do	57,418	51,047	47,148
Refinery products:			
Gasoline, aviation do	2,099	1,677	210
Gasoline, other do	20,081	19,392	22,928
Jet fuel do	15,181	12,141	11,526
Kerosine do	2,309	6,100	5,782
Distillate fuel oil do	17,116	15,269	18,728
Residual fuel oil do	88,271	91,501	79,272
Lubricants do	1,471	1,261	1,270
Other do	2,353	1,832	1,787
Refinery fuel and losses do	5,196	5,687	4,045
Total do	154,077	154,860	145,548
Sand and gravel:			
Pitch sand thousand cubic meters	28	12	NA
Other sand and gravel do	190	92	NA
Stone:			
Diorite do	NA	3	NA
Limestone do	266	[9] 199	NA
Porcellanite do	43	35	NA
Sulfur, elemental, byproduct metric tons	4,301	4,194	[e] 4,000

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the countries listed individually in this table, Bermuda, also covered by this chapter, presumably produces crude construction materials (clays, sand and gravel, and stone) but output is not reported and available information is inadequate to make reliable estimates of output levels.

[2] In addition to the commodities listed, mineral commodity output may also include crude construction materials (clays, sand and gravel, stone, and lime) other than those listed (if any) but data on such production are not collected and general information is inadequate to make reliable estimates of output.

[3] Official figures are not available; data on products listed individually are converted to barrels from metric tons given in: United Nations, World Energy Supplies 1961–70, Statistical Papers, Series J, No. 15, New York, 1971, pp. 122–245; total estimated from crude oil imports reported on pp. 102–108 of same source; other products derived by subtraction.

[4] Of total output, a large part in each year was used locally for fill, with only a small part of the total exported, for agricultural use. Exports totaled 60,600 tons in 1969 and 109,775 tons in 1970 (1971 data not available).

[5] In addition, chromite, gypsum, iron ore, manganese ore, pyrite, and salt, all produced in significant quantities prior to the termination of publication of official statistics, presumably were produced during the period covered by the table, but information is inadequate to formulate reliable estimates of output.

[6] Shipments.

[7] Salt presumably also is produced, but output is not reported, and information is inadequate to make reliable estimates of output levels.

[8] Includes volcanic tuff and materials used for fill, ballast, and other purposes.

[9] Excludes output for cement production; a total of 408,140 metric tons of limestone and clays (undifferentiated) was reportedly produced for this purpose in 1969.

Table 2.—Bahamas: Foreign trade of crude oil and petroleum products

(Thousand 42-gallon barrels unless otherwise specified)

EXPORTS

Commodity	1969	1970	Principal destinations, 1970
Petroleum:			
Refinery products:			
Gasoline:			
Motor	1	1,625	Puerto Rico 1,164; United States 434; Turks Islands 26.
Aviation	2	213	Puerto Rico 207; Turks Islands 6.
Kerosine	1	15	Mainly to Turks Islands.
Jet fuel	(1)	152	All to United States.
Distillate fuel oil	2	2,531	Canada 1,093; United Kingdom 565; Netherlands 468.
Residual fuel oil	1	2,680	United States 2,503; Canada 124.
Lubricants	(1)	(1)	NA.
Mineral jelly and wax value, thousands	$420	$6	All to Venezuela.
Other, liquefied petroleum gas	(2)	1	Jamaica 1.

IMPORTS

Commodity	1969	1970	Principal sources, 1970
Petroleum:			
Crude and partly refined	42	18,857	Libya 5,564; Nigeria 5,422; United States 2,298; Liberia 2,018.
Refinery products:			
Gasoline:			
Motor	703	540	United Kingdom 172; Venezuela 151; Jamaica 133.
Aviation	632	352	United States 189; Curaçao 78; Venezuela 36; Netherlands 36.
Kerosine	568	212	Aruba 122; Netherlands 58; Jamaica 30.
Jet fuel	45	66	Netherlands 41; Argentina 20; United States 4.
Distillate fuel oil	1,075	1,012	Venezuela 543; Jamaica 146; United Kingdom 130.
Residual fuel oil	102	2,345	Venezuela 1,268; Curaçao 273; Aruba 271; Spain 244.
Lubricants	108	49	United States 24; Jamaica 20; United Kingdom 4.
Mineral jelly and wax	--	(1)	
Other, liquefied petroleum gas	(2)	103	United States 58; Venezuela 25; United Kingdom 20.

NA Not available.

[1] Less than ½ unit.

[2] No tonnage figure reported but values for unspecified quantities were given in source, exports were valued at US$24,000; imports were valued at US$1,615,000.

BARBADOS [2]

General Crude Oil Co. of Houston, Tex., which held the only petroleum exploratory concession in Barbados, completed one exploratory well during 1971. This onshore well, Ruby 1, located at the southeastern end of the island, was drilled to a depth of 10,000 feet before being abandoned as a dry hole.

Two 5,000-foot wells in General Crude Oil's Turner Hall field continued to produce small quantities of crude oil and natural gas. The island's small refinery, owned by Mobil Oil Barbados, Ltd., had an average throughput of approximately 2,500 barrels per day.

The production of mineral commodities in Barbados is shown in table 1.

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[2] Gordon W. Koelling, geographer, Division of Fossil Fuels.

Table 3. Barbados: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum metal including alloys, all forms	46	23
Copper metal including alloys, all forms	2	4
Iron and steel:		
Scrap	(1)	2,186
Pig iron, ferroalloys, and similar materials	17	5
Steel, primary forms	(1)	18
Semimanufactures	647	884
Lead metal including alloys, all forms	340	64
Tin metal including alloys, all forms ... long tons	9	1
Zinc metal including alloys, all forms	[r] 2	1
Other ash and residue containing nonferrous metals	[r] 300	92
NONMETALS		
Cement	58	12
Clays and products (including all refractory brick):		
Crude clays n.e.s	11	(1)
Products:		
Refractory (including nonclay bricks)	28	2
Nonrefractory	293	272
Diamond, gem not set or strung ... carats	[r] 11,544	--
Diatomite and other infusorial earths	1	--
Fertilizer materials	11	(1)
Lime	8,855	6,122
Salt	6	16
Sodium and potassium compounds n.e.s	[r] 6	6
Stone, sand and gravel:		
Dimension stone:		
Crude	361	12
Worked	169	52
Gravel and crushed stone	2,146	1,329
Sand excluding metal bearing	--	2
Sulfuric acid	1	(1)
Other crude nonmetals n.e.s	7	6
MINERAL FUELS AND RELATED MATERIALS		
Coal and briquets	6	4
Peat and briquets	--	2
Petroleum refinery products:		
Gasoline ... thousand 42-gallon barrels	86	45
Kerosine and jet fuel ... do	212	346
Distillate fuel oil ... do	[r] 465	343
Residual fuel oil ... do	[r] 644	551
Lubricants ... do	1	2
Other:		
Nonlubricating oils ... do	4	(1)
Other ... do	3	1

[r] Revised.

[1] Less than ½ unit.

Table 4.—Barbados: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum metal including alloys, all forms	123	110
Cobalt oxides and hydroxides	4	(1)
Copper metal including alloys, all forms	[r] 37	89
Iron and steel metal:		
Scrap	61	65
Pig iron, ferroalloys, and similar materials	10	6
Steel, primary forms	84	62
Semimanufactures	9,503	12,141
Lead:		
Oxides	32	67
Metal including alloys, all forms	108	115
Silver metal including alloys ... troy ounces	1,155	3,484
Tin metal including alloys, all forms ... long tons	553	621
Titanium oxides	141	197
Zinc:		
Oxides	11	40
Metal including alloys, all forms	38	87
Other:		
Ash and residue containing nonferrous metals	--	30
Oxides, hydroxides and peroxides of metals n.e.s	[r] 6	4
NONMETALS		
Abrasives, natural, n.e.s	4	24
Asbestos	(1)	4
Cement	51,024	54,336
Chalk	2	1
Clays and products (including all refractory brick):		
Crude n.e.s	24	45
Products:		
Refractory (including nonclay bricks)	45	151
Nonrefractory	486	666
Diamond, gem not set ... thousand carats	[2] 12	--
Diatomite and other infusorial earths	[r] 42	65
Fertilizer materials:		
Manufactured:		
Nitrogenous	4,505	1,606
Phosphatic	10	33
Potassic	3,058	812
Other including mixed	6,476	9,515
Ammonia	18	12
Lime	293	102
Pigments, mineral, iron oxides, processed	4	1
Salt	[r] 1,967	2,332
Sodium and potassium compounds, n.e.s.:		
Caustic soda	184	183
Caustic potash, sodic and potassic peroxides	6	10
Stone, sand and gravel:		
Dimension stone:		
Crude and partly worked	17	64
Worked	120	65
Gravel and crushed rock	253	262
Sand excluding metal bearing	5	19
Sulfuric acid	122	117
Other nonmetals n.e.s.:		
Quartz, mica, feldspar, etc	10	57
Other	[r] 76	97
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	947	711
MINERAL FUELS AND RELATED MATERIALS		
Carbon black	(1)	1
Coal including briquets, all grades	[r] 205	205
Coke and semicoke	40	44
Hydrogen and rare gases	93	2
Peat and briquets	4	21
Petroleum:		
Crude ... thousand 42-gallon barrels	574	604
Refinery products:		
Gasoline ... do	55	124
Kerosine and jet fuel ... do	367	422
Distillate fuel oil ... do	540	316
Residual fuel oil ... do	[r] 784	562
Lubricants ... do	13	12
Mineral jelly and wax ... do	1	(1)
Other:		
Liquefied petroleum gas ... do	[r] 30	38
Other ... do	[r] 10	3
Mineral tar and other coal–, petroleum–, or gas–derived crude chemicals	3	11

[r] Revised.

[1] Less than ½ unit.

[2] Reported as industrial diamond last year.

BERMUDA [3]

Mineral production in Bermuda in 1971 consisted of small quantities of sand, dimension limestone, and crushed limestone. Limestone quarried for use in private residences is a soft, porous, but very durable, type of dimension stone. Production of crushed limestone totals about 50,000 tons per year. The great bulk of the output is used as aggregate in asphalt mixes; the remainder is used in paving and concrete construction units such as blocks and curbing. Imports consisted principally of petroleum refinery products, cement, and fertilizers. Table 5 shows foreign trade in selected mineral commodities for 1968 and 1969.

CUBA [4]

Since diplomatic relations were broken between the United States and Cuba on January 3, 1961, U.S. interests in Cuba have been represented by Switzerland; therefore, no firsthand information concerning the mineral industry was available for 1971.

The country is endowed with significant deposits of nickel, iron, copper, chromium, manganese, tungsten, and asphalt. No major petroleum deposits have been discovered although some minor deposits do exist and are being exploited. Extensive low-grade, mostly lateritic nickel deposits, which could supply a good portion of the world's nickel requirements, were located around Nicaro and Moa Bay on the north coast of Oriente Province. As an export, nickel is the second most valuable commodity after sugar, providing about 10 percent of the total export earnings.

COMMODITY REVIEW

Cement.—A second kiln was installed at the Nuevital plant in Camaguey Province. Final mill capacity will be 600,000 tons per year. In addition, two cement plants are under construction, one by the U.S.S.R. and one by Czechoslovakia. Each plant will have a capacity of about 400,000 tons per year.

Copper.—Production from the Capitan Alberto Fernandez copper mine (formerly the Matahambre mine) has been about 3,000 metric tons annually in recent years. Plans for expansion of the facility have been underway for some time to develop and mine the newly discovered extensions of the ore body that may supply copper for at least another 10 years at the current rate of mining.

Nickel.—Cuba's nickel reserves are among the world's largest. The ore is processed on the island in its plants at Nicaro and Moa Bay. Plans are underway to build a new 30,000-ton-per-year oxide plant at Punta Gorda, which would put the capacity of nickel production at 120,000 tons per year. About 40,000 tons of nickel oxide and nickel sulfide are exported annually, which provides more than 10 percent of the total export earnings.

Petroleum.—No statistics are available on Cuban crude oil output, but it was estimated that between 2,000 and 2,500 barrels of oil per day is being produced. No change in refining capacity was known of at Belot, Cabaiguan, Havana, and at Santiago de Cuba. Reports indicate capacities of 8,000, 2,000, 27,000 and 20,000 barrels of crude throughput per day, respectively. Cuba must rely on the Soviet Union for about 95 percent of its domestic oil requirements.

At yearend, the Cuban Government was studying the feasibility of building a $40 million synthetic fertilizer complex at Cienfuegos. Plans are for production of 700 tons per day of ammonium nitrate.

Other.—Among other minerals, Cuba produced about 1,100 metric tons of chromite, which was exported. Manganese was also produced both for consumption within the country and for export. Both chromite and manganese ore were mined in the Oriente Province.

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[3] Harold J. Drake, physical scientist, Division of Nonmetallic Minerals.

[4] Herbert R. Babitzke, chemist, Division of Nonferrous Metals.

Table 5.—Bermuda: Foreign trade of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970 [1]
EXPORTS AND REEXPORTS		
Petroleum refinery products:		
Gasoline, aviation thousand 42-gallon barrels	[r] 36	38
Gasoline, other do	[r] 11	17
Kerosine do	1	(2)
Jet fuel do	[r] 817	798
Residual fuel oil do	[r] 226	177
Lubricating oil do	(2)	(2)
Scrap metal unspecified value, US dollars	137,474	302,673
IMPORTS		
METALS		
Aluminum metal including alloys, all forms	NA	1,123
Copper metal including alloys, all forms	NA	1,040
Iron and steel:		
Pig iron, sponge iron and ferroalloys	NA	4,486
Steel, primary forms	NA	13,392
Semimanufactures	NA	327,159
Lead metal including alloys, all forms	NA	144
Nickel metal including alloys, all forms	NA	13
Platinum-group metals and silver:		
Metals including alloys:		
Platinum group troy ounces	NA	375
Silver do	NA	29,356
Tin metal including alloys, all forms long tons	NA	6
Zinc metal including alloys, all forms	NA	2
Other metals including alloys, all forms	NA	18
NONMETALS		
Abrasives, natural, grinding and polishing wheels and stones	NA	3
Cement:		
Portland	1,409	49
Other	[r] 2,548	
Clays and products:		
Clays and other refractory materials	NA	9
Clay bricks	[3] $9,322	250
Diamond not set or strung carats	NA	579
Fertilizer materials:		
Crude	1,056	12
Manufactured:		
Nitrogenous		7
Phosphatic		2
Mixed		133
Gypsum and plaster	244	65
Lime	2,686	86
Precious and semiprecious stones, except diamond:		
Natural carats	NA	186
Manufactured do	NA	14
Salt	159	71
Stone, sand and gravel:		
Dimension stone	--	1
Gravel and crushed stone	[4] 13,310	31,644
Sand		39,613
MINERAL FUELS AND RELATED MATERIALS		
Coal and coke, including briquets	15	(2)
Petroleum refinery products:		
Gasoline thousand 42-gallon barrels	[r] 226	254
Kerosine do	245	630
Jet fuel do	509	
Distillate fuel oil do	185	787
Residual fuel oil do	329	
Lubricants (including grease) do	8	6
Other:		
Asphalt [5] do	[r] 17	14
Other do	38	11

[r] Revised. NA Not available.

[1] For year beginning April 1, 1970.

[2] Less than ½ unit.

[3] Value in US$1.00.

[4] Includes stone chips.

[5] Includes 926 barrels of natural asphalt and bitumen.

Source: Report of the Customs Imports and Exports, Bermuda, 1969 and 1970.

Table 6.—Cuba: Selected mineral commodity trade with Poland

(Metric tons)

Commodity	1969	1970
EXPORTS TO POLAND		
Chrome ore	9,614	17,727
Copper concentrate	587	--
Manganese ore	15,546	NA
Other nonferrous metal concentrates	478	228
IMPORTS FROM POLAND		
Steel semimanufactures	810	300
Petroleum products	3,890	494

NA Not available.

Source: Rocznik Statystyczny Handlu Zagranicznego (Foreign Trade Statistical Yearbook), 1970, Warsaw 1971, 458 pp.

Table 7.—Cuba: Selected mineral commodity imports from U.S.S.R. [1]

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum metal including alloys, all forms	[r] 5,779	4,218
Copper metal including alloys, all forms	[r] 5,143	5,693
Iron and steel:		
Pig iron	85,400	72,400
Ferroalloys	1,900	2,700
Steel semimanufactures	[r] 183,600	235,800
Lead metal including alloys, all forms	1,100	1,200
Zinc metal including alloys, all forms	500	500
NONMETALS		
Asbestos	10,600	9,500
Cement, hydraulic	133,000	103,000
Fertilizer materials:		
Nitrogenous:		
Urea	4,600	37,100
Other manufactured	217,800	247,700
Phosphatic	52,500	82,500
Potassic	80,800	76,800
Refractory materials	13,300	12,100
Sodium compounds n.e.s.:		
Caustic soda	25,900	16,300
Soda ash	6,779	8,019
Sulfur	111,200	137,200
MINERAL FUELS AND RELATED MATERIALS		
Carbon black	[r] 3,027	2,425
Coal:		
Anthracite ... thousand tons	62	41
Bituminous ... do	24	10
Coke ... do	33	38
Petroleum, crude oil and refinery products ... do	[r] 5,759	5,987

[r] Revised.

[1] Soviet exports to Cuba, reported in: Vneshnyaya Torgoviya S.S.S.R. za 1970 god (Foreign Trade of the U.S.S.R. for 1970). Moscow, 1971, 298 pp.

DOMINICAN REPUBLIC [5]

The Government of the Dominican Republic enacted a new mining law in June 1971. The principal features of the mining law included: recipients of exploitation concessions must form Dominican companies; exploration concessions are granted for 3 years and are limited to 30,000 hectares, and exploitation rights are granted for 75 years and limited to 20,000 hectares; concessions are forfeited upon failure to meet timing and work requirements; deductions for depletion are not permitted; royalties on exports are set at 5 percent of f.o.b. value; export prices are set by the Dominican Government; the negotiation of an accelerated depreciation schedule is permitted; certain categories of imports used in exploration and exploitation operations can be exonerated or pay reduced tariff duties for the first 25 years of operations;

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[5] E. Chin, chemist, Division of Nonferrous Metals.

and the Dominican Government retained the right to declare certain areas as reserves, the initial exploration of which is to be performed by the Government, with exploitation rights in these areas to be granted by the Government on a contract basis.

The Dirrección de Minerias was in the process of reorganizing existing concessions in accord with the terms of the new law. Tenneco Oil Co., Bellomar, Inc., and Pitman Petro Mining Co. were among companies that had to relinquish their concessions in order to meet the requirements of the new mining law. Since the exactment of the 1971 mining law, Honduras Rosario Mining Co., and Morrison-Knudsen Construction Co. have applied for mineral concessions in the country.

COMMODITY REVIEW

Aluminum.—Bellomar, a consortium composed of Campbell Chibougamau Mines Ltd., Bayou Interests, Inc., and the Phelan Sulphur Co., investigated two bauxite prospects through its exploration concessions. The larger concession in the Barahona Peninsula covers an area of more than 776,400 acres. The second area covers about 324,000 acres in the northern region of the country. The Aluminum Company of America has been mining bauxite since the late 1950's at a rate of about 1 million tons per year in the Barahona Peninsula.

Cement.—Despite a shortage of cement, the Government did not grant permission for the construction of two cement plants proposed by a Dominican-Spanish group at a site in Barahona and the other at Guavacanes by Gulf-Western Industries Inc. The country's only cement plant, which is Government-owned, increased production in 1971 by 23 percent.

Copper.—Denison Mines continued exploration drilling on the Lion Mines porphyry copper-zinc prospect.

Toledo Mining Co. acquired exploration rights over three sites covering approximately 140,000 acres. Preliminary examinations of the prospects indicated potential copper deposits of substantial tonnages.

Mitsubishi Metal Mining Co., Ltd., and Northbridge Mines, Ltd., voluntarily abandoned copper concessions during the year.

Gold and Silver.—Honduras Rosario Mining Co., in a joint venture with J. R. Simplot Co., New York, outlined a gold-zinc-silver-copper ore body, which is amenable to open pit mining, at its Pueblo Viejo prospect. Exploration work reportedly indicated a commercial ore body containing in excess of 6,500,000 tons of oxidized gold-silver ore averaging 0.192 ounce of gold and 1.48 ounces of silver per ton. The ore consists of a mixture of oxide and sulfide minerals. An additional deposit containing 17,700,000 tons of complex sul-

Table 8.—Dominican Republic: Imports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1968	1969	1970
METALS [1]			
Copper including alloys, semimanufactures	831	NA	765
Gold, silver, and platinum metal unworked and worked ..... troy ounces	25,045	NA	NA
Iron and steel semimanufactures	48,195	NA	59,812
Other nonferrous metals, all forms	2,123	NA	3,410
NONMETALS [1]			
Cement	3,893	NA	5,551
Gem stones (including pearls) unmounted ..... kilograms	2,260	NA	NA
MINERAL FUELS AND RELATED MATERIALS			
Coal and coke including briquets	537	NA	NA
Petroleum refinery products: [2]			
Gasoline ..... thousand 42-gallon barrels	1,317	1,653	1,947
Kerosine and jet fuel ..... do	401	380	477
Distillate fuel oil ..... do	849	719	799
Residual fuel oil ..... do	2,318	2,472	2,774
Lubricants ..... do	52	137	180
Other ..... do	227	358	342

NA Not available.

[1] Data for metals and nonmetals from 1970 edition of Supplement to the World Trade Annual. V. 2 (South and Central America) published by Walker and Co., New York, 1972.

[2] From International Petroleum Annual, 1969 and 1970.

fide ore averaging 0.131 ounce of gold, 1.12 ounces of silver, and 2.19-percent zinc, and 0.252-percent copper was outlined.

Nickel.—The nickel mining and metallurgical complex in the Bonao area, about 60 miles to the northwest of Santo Domingo, started production. The mine was developed by Falconbridge Dominicana C. por A., a subsidiary of Falconbridge Nickel Mines, Ltd. Armco Steel Corp. holds a 16.4-percent interest in the enterprise.

Opencast mining methods are employed, and the lateritic ore is treated by a new metallurgical process developed by Falconbridge. The deposits contain reserves estimated at 64 million metric tons of nickel. The production capacity of this complex is expected to be more than 63 million pounds of ferronickel per year when the mine and plant are in full production.

On December 29, 1971, the first ferronickel exports by Falconbridge Dominicana left the port of Haina representing the culmination of the $180,000,000 project initiated by Falconbridge in 1956.

HAITI [6]

An agreement to develop bauxite in Haiti was signed by the Haitian Development Bank and Haiti Mineral Corp. of America. The agreement excluded the present workings by Reynolds Haitian Mines S. A. The concession agreements with Haiti Minerals were for 30 years with an option for renewal for an additional 20 years. Total bauxite reserves in Haiti were estimated to be between 40 and 50 million tons.

International Halliwell Mines of Canada was nearing completion of its exploration activities for copper at its holdings in Haiti. Upon completion of Halliwell's intensive drilling program started 2 years ago, an assessment of the prospects will be made. Sedren S.A., a subsidiary of Consolidated Halliwell Ltd., operates a 150,000-ton-per-year copper mine at Mémé.

The Haitian Government granted a prospecting license for copper and other minerals in the northern region of Haiti to the Haicana Mining Corp. S.A. The duration of the concession was 25 years, with the right of an extension for another 25 years.

JAMAICA [7]

Jamaica was the world's largest bauxite producer in 1971 with production reaching over 12.7 million long dry tons. Alumina production in 1971 was over 1.8 million long dry tons. The value of bauxite and alumina production accounted for over 13 percent of Jamaica's gross national product.

Kaiser Bauxite Co. remained the largest producer. Alcan Jamaica Ltd., Reynolds Jamaica Mines Ltd., Alcoa Minerals of Jamaica Inc., and Revere Jamaica Alumina Ltd. also mined bauxite.

According to the Ministry of Trade and Industry, Reynolds, Alcoa, and Kaiser agreed to pay $3.9, $0.9, and $6.5 million, respectively, to the Government of Jamaica for retroactive income taxes from 1966.

Table 9.—Haiti: Exports of mineral commodities [1]
(Metric tons)

Commodity	1969	1970	Principal destinations, 1970
Aluminum:			
Bauxite	764	646	All to United States.
Metal semimanufactures	1	(2)	NA.
Copper metal, all forms	6	5	All to Japan.
Iron and steel, all forms	1	14	Mainly to United States.

NA Not available.
[1] Years ended September 30 of those stated.
[2] Less than ½ unit reported.

Source: Rapport Annuel de L'Administration Generale des Douanes, Pour L'Exercice, 1969 and 1970.

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[6] E. Chin, chemist, Division of Nonferrous Metals.
[7] E. Chin, chemist, Division of Nonferrous Metals.

Table 10.—Haiti: Imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum metal, all forms	142	245	Austria 155; United States 55.
Copper metal, all forms	9	17	United States 11; Mexico 2.
Iron and steel semimanufactures	6,954	10,544	France 4,095; Belgium-Luxembourg 2,319; Japan 1,152.
Lead:			
Ores and concentrates	22	--	
Metal, all forms	10	(2)	NA.
Nickel metal, scrap	1	(2)	NA.
Silver metal kilograms	4	--	
Tin metal, all forms long tons	152	356	United States 176; West Germany 164.
NONMETALS			
Cement	316	229	Denmark 114; France 43; United States 25.
Chalk	--	18	Mainly from Puerto Rico.
Clays:			
Crude	75	48	United States 34; West Germany 14.
Manufactured products	60	225	United States 136; Japan 61; United Kingdom 17.
Diamond, industrial thousand carats	880	55	All from United States.
Fertilizers:			
Crude:			
Phosphatic	14	15	Puerto Rico 14; United States 1.
Potassic	--	37	United States 28; France 9.
Manufactured, nitrogenous	116	(2)	NA.
Graphite, natural	--	1	Mainly from Canada.
Salt	53	125	United States 107; Netherlands 18.
Stone, sand and gravel:			
Dimension stone	3,457	20	West Germany 13; United States 5.
Sand and gravel	2	3	All from United States.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt, natural	350	166	Jamaica 104; West Germany 37; United States 25.
Coke and semicoke	3	(2)	NA.
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	87	74	Curaçao 68.
Kerosine do	9	3	United States 1; Curaçao 1.
Distillate fuel oil do	464	542	Curaçao 344; Honduras 63.
Lubricants do	11	11	United States 5; Curaçao 3.
Other do	2	3	Mainly from United States.

NA Not available.

[1] Years ended September 30 of those stated.

[2] Less than ½ unit reported.

Source: Rapport Annuel de L'Administration Générale des Douanes, Pour L' Exercice, 1969 and 1970.

Under the agreements, the companies accepted an imputed profit of $4.92 per ton of bauxite exported compared with the former rate of $3.79 per ton.

The new alumina plant of Revere Jamaica started operations in 1971. Output from this plant, with a rated annual capacity of 199.6 thousand tons of alumina, will be shipped to Burnside, La., reloaded into barges, and carried up river to the Revere aluminum reduction plant at Scottsboro, Ala.

Alcan Jamaica produced over 1 million tons of alumina at its installations at Ewarton and Kirkvine. Aluminum Partners of Jamaica (Alpart) and Revere Jamaica accounted for the remainder of the alumina production in Jamaica. Alpart, jointly owned by Kaiser, Reynolds, and The Anaconda Company, has a capacity of 861.8 thousand tons of alumina per year. Expansion of Alpart's alumina capacity to 1.3 million tons per year at its installation at Nain in St. Elizabeth Parish was more than three-quarters completed at yearend.

Alcoa's new alumina plant in Clarendon Parish also was nearing completion. This installation consists of two units, each having a rated capacity of 199.6 thousand tons of alumina per year. With the completion of planned plant expansions, Jamaica will have an annual alumina production capacity close to 2.8 million tons by 1973.

Merland Explorations Ltd. continued its diamond drilling geophysical program to find copper anomalies. Induced polarization surveys were made at Eping Farm, Ugly and Flint Rivers, and Whitfield Hall. General Crude Oil Co. of Houston, Tex., assisted in financing this project.

Table 11.—Jamaica: Foreign trade of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969 [1]	1970 [2]
EXPORTS		
METALS		
Aluminum:		
Bauxite and concentrate	7,723,419	9,392,557
Oxide (alumina) and hydroxide	1,195,913	1,330,337
Metal scrap	NA	295
Copper:		
Ore and concentrate	NA	355
Metal scrap	NA	565
Iron and steel scrap	NA	1,369
Lead metal unwrought and semimanufactures	NA	185
Zinc ore and concentrate	NA	600
NONMETALS		
Cement	71,368	NA
Gypsum	[3] 342,637	242,218
MINERAL FUELS AND RELATED MATERIALS		
Petroleum refinery products (excluding bunkers):		
Gasoline thousand 42-gallon barrels	33	820
Kerosine do	50	65
Distillate fuel oil do	388	229
Residual fuel oil do	246	--
Lubricants do	116	15
Other do	(4)	--
IMPORTS		
METALS		
Aluminum metal including alloys, all forms	NA	3,766
Copper metal including alloys, semimanufactures	NA	604
Iron and steel, all forms	108,622	114,068
Lead:		
Oxide	NA	309
Metal including alloys, all forms	NA	271
Manganese ore and concentrates	NA	130
Tin metal including alloys, all forms long tons	NA	16
Titanium oxides	NA	216
Zinc metal including alloys, all forms	NA	274
NONMETALS		
Asbestos	NA	659
Cement	NA	1,975
Clays, crude n.e.s	NA	1,052
Fertilizer materials manufactured	NA	35,012
Mica	NA	956
Sand excluding metal bearing	NA	1,468
Sodium compounds, caustic soda	NA	327,983
Sulfur, elemental, other than colloidal	NA	5,957
Talc and steatite	NA	257
MINERAL FUELS AND RELATED MATERIALS		
Carbon black	NA	687
Coal, coke and briquets	NA	668
Petroleum:		
Crude thousand 42-gallon barrels	11,287	9,880
Refinery products:		
Gasoline do	54	1,061
Kerosine and jet fuel do	177	385
Distillate fuel oil do	313	115
Residual fuel oil do	1,325	191
Lubricants do	128	88
Other do	11	12

NA Not available.

[1] Source: Department of Statistics. External Trade Bulletin, December 1969. Trade Statistics Unit, Bulletin 274, Kingston, Jamaica, 1970, 34 pp.

[2] Source: Statistical Office of the United Nations. Supplement to the World Trade Annual 1970, South and Central America, including the Caribbean and Bermuda. V. 2, Walker and Company, New York, 1972, pp. 638–641, and 642–658.

[3] May include other crude nonmetals.

[4] Total refinery products was erroneously reported as other refinery products for 1969.

Caribbean Cement Co., Ltd. planned to install a fourth kiln at its plant in Rockport, Kingston Parish. When completed in 1972, the company's annual capacity to produce cement will be increased to 650,000 tons. Plans to build a cement plant in the port at Montego Bay were suspended inasmuch as the cash flow from the Rockport operations could not provide the required capital. Caribbean Cement purchased property at Montego Bay to be used for the erection of a plant in the event that the project should prove to be feasible. The company continued to seek concessions or incentives for the proposed plant from the Jamaican Government.

MARTINIQUE [8]

Mineral production in Martinique in 1971 consisted of construction aggregates, clays, marine salt, fertilizers, cement, and petroleum refinery products. Production of crushed stone in 1971 is estimated to have been about 800,000 tons, salt about 300,000 tons, and sand about 250,000 tons. Small tonnages of clays and pumice were also produced. No official statistics were reported on the output of fertilizer and cement.

Construction of an oil refinery and a cement plant was completed and production begun in January 1971. Production data from these facilities were not reported. Mineral production on Guadeloupe, consisting principally of construction aggregates and cement, was not reported in official statistics. The establishment of an oil refinery and deep water port was still under study at yearend.

NETHERLANDS ANTILLES [9]

Petroleum refining continued to be the most important industry in the Netherlands Antilles during 1971. Operations of the Aruba refinery of Lago Oil and Transport Co., a subsidiary of Standard Oil Co. (New Jersey), and the Curaçao plant of Shell Curaçao, N.V., contributed over one-fifth of the area's total Gross National Product and provided employment for over 5,000 workers.

Table 12.—Netherlands Antilles: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Iron and steel metal, scrap and other	4,658	360
Lead metal including alloys	13	50
Silver and platinum-group metal ... value	$5,833	$107,117
Other nonferrous metals	2,238	1,264
NONMETALS		
Fertilizer materials:		
Crude	113,171	91,521
Manufactured:		
Nitrogenous	118,751	67,586
Ammonia	39,907	65,715
Stone, sand and gravel	850	975
Other	72	119
MINERAL FUELS AND RELATED MATERIALS		
Petroleum:		
Crude ... thousand 42-gallon barrels	2,670	4,950
Refinery products: [1]		
Aviation gasoline ... do	6,159	1,819
Motor gasoline ... do	27,685	15,059
Kerosine and white spirit ... do	17,810	14,542
Jet fuel ... do	19,941	16,003
Distillate fuel oil ... do	22,764	26,280
Residual fuel oil ... do	147,681	175,034
Liquefied petroleum gas ... do	316	345
Lubricants including grease ... do	6,013	6,239
Mineral jelly and wax ... do	247	220
Bitumen and other residues ... do	6,587	6,533
Other ... do	6,595	5,526

[1] Data obtained from refinery companies.

Source: Unless otherwise specified, Jaarstatistiek Van de In-en Uitvoer Per Goederensoort Van de Nederlandse Antillen, Bureau Voor de Statistiek (Annual Statistical Report of Import and Export Commodities of the Netherlands Antilles by the Bureau of Statistics 1969 and 1970).

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[8] Harold J. Drake, physical scientist, Division of Nonmetallic Minerals.

[9] Gordon W. Koelling, geographer, Division of Fossil Fuels.

Table 13.—Netherlands Antilles: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum metal including alloys, all forms	250	195
Copper metal including alloys, all forms	279	376
Iron and steel semimanufactures	37,072	51,974
Lead metal including alloys, all forms	43	78
Nickel metal including alloys, all forms	2	132
Tin metal including alloys, all forms ... long tons	8	13
Zinc metal including alloys, all forms	123	88
Other:		
Nonferrous metal scrap	195	214
Base metals including alloys n.e.s	17	44
NONMETALS		
Cement	48,552	72,738
Clays and products (including all refractory brick):		
Crude	6,022	3,039
Manufactured	1,416	2,645
Diamond, gem not set or strung ... carats	1,905	--
Fertilizer materials:		
Crude	1	--
Manufactured	727	488
Gypsum and plasters	36	94
Lime	100	540
Precious and semiprecious stones, except diamond ... troy ounces	154	184
Salt	862	1,032
Sodium compounds	26,590	21,549
Stone, sand and gravel	7,116	32,001
MINERAL FUELS AND RELATED MATERIALS		
Coal, coke and briquets	14	40
Gas, liquefied petroleum, petroleum gas ... thousand 42-gallon barrels	271	259
Petroleum:[1]		
Crude ... do	285,450	318,253
Refinery products:		
Gasoline ... do	2,432	456
Kerosine and jet fuel ... do	342	260
Distillate fuel oil ... do	1,531	2,865
Residual fuel oil ... do	15,645	12,278
Lubricants ... do	117	649
Other ... do	21	20
Mineral tar and other coal–, petroleum–, or gas–derived crude chemicals	22	14

[1] Data obtained from refinery companies.

Source: Unless otherwise specified, Jaarstatistiek Van de In-en Uitvoer Per Goederensoort Van de Nederlandse Antillen, Bureau Voor de Statistiek (Annual Statistical Report of Import and Export Commodities of the Netherlands Antilles by the Bureau of Statistics 1969 and 1970).

During August 1971, a 100,000-barrel-per-day hydrodesulfurization unit was placed onstream at the Aruba refinery. This unit is to use refinery pentanes as the hydrogen source for desulfurization. When operated at capacity, the unit will have a byproduct sulfur output of approximately 300 tons per day.

Installation of a refrigerated butane storage tank was completed at the Curaçao refinery during the early part of 1971. This 88,000-barrel tank was erected adjacent to the plants's two 44,000-barrel refrigerated propane tanks. The new tank is a single wall vessel insulated by a rigid polyurethane temperature barrier and is capable of storing butane as a liquid at approximately atmospheric pressure. Design and construction of the tank was carried out by the Chicago Bridge and Iron Co.

At yearend, work was in progress on a 3,000-barrel-per-day lube oil unit at Curaçao. This project was scheduled for completion during 1972.

The output of mineral commodities in the Netherlands Antilles is shown in table 1.

TRINIDAD AND TOBAGO[10]

Although crude oil output declined almost 8 percent during 1971, petroleum production and refining continued to account for about 25 percent of Trinidad and Tobago's gross national product, were the source of approximately 30 percent of

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[10] Gordon W. Koelling, geographer, Division of Fossil Fuels.

Government revenue, and were responsible for more than 80 percent of the country's total export receipts.

The rapid decline in crude oil production from a peak of 183,298 barrels per day in 1968 to 129,173 barrels per day during 1971 resulted primarily from the depletion of several of the fields operated by Trinidad Northern Areas, Ltd., and Texaco Trinidad, Inc., the country's principal oil producing companies. The greatest rate of decline in 1971 was experienced by Trinidad Northern Areas, Ltd., as a result of mechanical problems with recently installed water injection facilities and increasing water production in a number of wells in the Guayaguayare field.

A reversal of the 3-year downward trend in crude oil output was expected to occur in 1972 as a result of field development activities in progress during 1971. The bulk of this activity involved recent oilfield discoveries off Trinidad's east coast. There, a 17-well platform located in the Trinidad-Tesoro Petroleum Co., Ltd., Galeota field was expected to initiate production at the beginning of 1972. This platform is connected to the shore by an underwater pipeline approximately 8 kilometers in length.

As of yearend 1971, development of the two Amoco Trinidad Oil Co., Ltd., east coast offshore oilfields was also well advanced. Work on the initial offshore production facilities in the Teak and Samaan (formerly Radix and North Point Radix) fields, a crude oil pipeline, and the necessary shore installations was 95-percent complete. A 37-kilometer, 16-inch pipeline had been constructed between the first of two production platforms in the Teak field to a tank farm and marine export terminal at Galeota Point. An additional 18 kilometers of 16-inch line extended from the Teak field to the production platform in the Samaan field. Plans were to initiate production from these fields at a combined rate of 40,000 barrels per day during February 1972 and to increase output to 70,000 barrels per day by the end of that year. Peak production of 130,000 barrels per day, as much as Trinidad's total average daily output in 1971, is expected to be reached in 1973 or 1974. Teak and Samaan crudes have an average gravity of 32.5° API and a low sulfur content.

The highest level of drilling activity since 1966 was recorded in 1971 when the combined footage of exploratory and development hole drilled totaled 939,134, a 42-percent increase over the 1970 figure. This sudden rise in activity was accounted for by the accelerated drilling program of Texaco Trinidad, Inc., in an attempt to arrest its rapidly declining production. However, the quantity of additional reserves discovered as a result of Texaco's program was slight, and the company's development drilling efforts were only moderately successful.

Amoco Trinidad Oil Co., Ltd., continued its east coast offshore drilling program during 1971 with most of its activity being directed toward the development of the Teak and Samaan fields. The seven exploratory wells drilled by Amoco resulted in an oil and gas discovery near the Samaan field and a gas discovery on the Tourmaline structure.

Three of the groups awarded exploration and production permits covering areas off Trinidad's north coast in 1970 engaged in exploratory drilling during 1971. The Phillips Petroleum Caribbean, Ltd.-Cleary Petroleum Corp.-APCO Oil Corp. combine drilled three wells; and the Deutsche Erdölversorgungsgesellschaft, mbh (Deminex)-AGIP, S.p.A., group and the Oceanic Exploration Co.-Santa Fe International Corp.-Terra Trinidad and Tobago, Ltd., consortium each drilled one well. All of the wells drilled by these groups were dry holes.

An exploration and production permit covering a 187,000-acre tract off the southeast coast of Trinidad, south of Amoco's Teak field, was awarded to a three-company consortium in October 1971. Both Texaco Trinidad, Inc., and Shell Trinidad, Ltd., hold a 37.5-percent interest in this consortium with the remaining 25-percent interest being held by Trinidad Tesoro Petroleum Co., Ltd., a company in which the Government holds a 50-percent interest. Should commercial quantities of oil and/or gas be discovered in this tract, the Government is entitled to a 20-percent interest in the consortium without contributing to exploration costs or to an overriding 10-percent royalty. Terms of the agreement also included a signature bonus, sliding-scale production bonuses, and a 15-percent royalty (in addition to the optional overriding royalty) on all production.

In December 1971, the Government contracted with Delta Exploration Co., Inc., of Houston, Tex., for a joint venture marine seismic survey covering 400,000 acres in the northern half of the Gulf of Paria and 1,340,000 unlicensed acres off Trinidad's east coast. Approximately 840,000 acres of the east coast area to be surveyed involve water depths of between 600 and 2,000 feet. The survey was scheduled for completion by mid-1972 after which the results are to be offered for sale to prospective bidders, who are then to be allowed 3 months for the preparation of competitive offers for exploration and production permits.

Refinery expansion programs in progress during 1971 included an increase to 20,000 barrels per day in hydrotreater capacity at the Shell Trinidad, Ltd., plant at Point Fortin, the addition of a 100,000-barrel-per-day vacuum distillation unit, an 80,000-barrel-per-day distillate hydrodesulfurizer, and a 250-ton-per-day sulfur recovery unit at the Texaco Trinidad, Inc., refinery at Pointe-a-Pierre. All of these facilities were scheduled for completion in 1972.

Table 14.—Trinidad and Tobago: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum metal including alloys, all forms	r 91	104
Copper:		
Ore	--	2
Metal including alloys, all forms	264	311
Iron and steel:		
Scrap	7,380	16,597
Steel, primary forms	2	9
Semimanufactures	1,054	806
Lead metal including alloys, all forms	61	56
Silver metal including alloys troy ounces	358	1,915
Tin metal scrap long tons	181	--
Other:		
Scrap, nonferrous metals	290	251
Base metals including alloys, all forms	(1)	31
NONMETALS		
Barite	819	--
Cement	--	71
Clays and products (including all refractory brick)	2,339	4,739
Fertilizer materials manufactured:		
Nitrogenous	116,695	94,306
Other	4,095	3,600
Lime	9,979	8,893
Precious stones cut troy ounces	25	8
Salt	30	16
Sodium and potassium compounds	5	13
Stone, sand and gravel:		
Dimension stone:		
Crude	3	(1)
Worked	1	2
Gravel and crushed stone	1,725	552
Sand	178	202
Other nonmetals n.e.s.:		
Crude	96	129
Building materials of asphalt, asbestos, and fiber cement, and unfired	2,061	1,007
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	45,637	60,450
Coal, coke and peat	7	9
Petroleum:		
Crude and partly refined [2] thousand 42-gallon barrels	6,230	8,669
Refinery products:		
Gasoline do	20,943	19,552
Kerosine do	2,621	6,911
Jet fuel do	14,625	11,594
Distillate fuel oil do	15,330	13,382
Residual fuel oil do	80,810	81,619
Lubricants do	1,394	1,271
Other do	2,227	1,627
Mineral tar and other coal–, petroleum–, or gas–derived crude chemicals	225,624	153,840

r Revised.

[1] Less than ½ unit.

[2] Government of Trinidad and Tobago, Ministry of Petroleum and Mines.

Texaco also announced plans to expand its Pointe-a-Pierre marine terminal facilities to accommodate tankers with a capacity of up to 260,000 deadweight tons. Some of the crude oil discharged from large tankers at this terminal is to be transshipped without further processing to other Western Hemisphere ports in smaller, shallower draught vessels.

At yearend 1971, Amoco Trinidad Oil Co. was preparing a formal proposal to the Government concerning the development of its recently discovered nonassociated natural gas reserves off Trinidad's east coast. These reserves are reportedly capable of supporting production at the rate of 500 million cubic feet per day. The most likely development of these reserves would involve the construction of gas liquefaction facilities in Trinidad and the export of liquefied natural gas (LNG) to the United States. The Government of Trinidad was expected to insist on some degree of participation in such a project.

The production of mineral commodities in Trinidad and Tobago is shown in table 1.

Table 15.—Trinidad and Tobago: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum:		
Bauxite and concentrate	11	208
Metal including alloys, all forms	[r] 970	455
Arsenic and compounds	3	16
Chromium ore and concentrate	26	--
Copper:		
Ore and concentrate	2	--
Copper sulfate	9	18
Metal including alloys, all forms	155	272
Iron and steel:		
Scrap	1,665	767
Pig iron, ferroalloys, and similar materials	14	138
Steel, primary forms	1,626	1,287
Semimanufactures:		
Bars, rods, angles, shapes, sections	[r] 15,956	19,266
Universals, plates and sheets	18,860	31,045
Hoop and strip	1,396	1,261
Rails and accessories	17	5
Wire	1,741	2,192
Tubes, pipes, and fittings	15,973	19,159
Castings and forgings	27	143
Lead:		
Ore and concentrate	2	20
Metal including alloys, all forms	[r] 150	358
Nickel metal including alloys, all forms	8	3
Platinum-group metals and silver:		
Metals including alloys:		
Platinum group ... troy ounces	162	3
Silver ... do	61,642	112,119
Tin metal including alloys, all forms ... long tons	1,240	66
Zinc metal including alloys, all forms	69	67
Other:		
Scrap, nonferrous metals	11	14
Metals including alloys, all forms	9	4
NONMETALS		
Abrasives, natural, n.e.s	27	23
Barite and witherite	67	7,090
Cement	[r] 3,348	5,251
Clays and products (including all refractory brick):		
Crude n.e.s	159	257
Products	2,422	3,303
Feldspar	488	677
Fertilizer materials:		
Crude	1	84
Manufactured:		
Nitrogenous	318	284
Phosphatic	[r] 498	896
Potassic	4,280	4,328
Other including mixed	2,055	1,428
Lime	33	21
Magnesite	46	151
Mica, all forms	11	27
Pigments, mineral	8	12
Precious and semiprecious stones, cut and uncut ... troy ounces	544	810

See footnotes at end of table.

Table 15.—Trinidad and Tobago: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970
NONMETALS—Continued		
Salt	11,076	10,706
Sodium and potassium compounds n.e.s.:		
Caustic soda	5,508	2,856
Caustic potash, sodic and potassic peroxides	1,795	2,850
Stone, sand and gravel:		
Dimension stone:		
Crude	14,611	11,918
Worked	116	84
Gravel and crushed stone	401	415
Sand	6	88
Sulfur:		
Elemental	19,114	15,744
Sulfuric acid	21	36
Other nonmetals, n.e.s.:		
Crude	684	812
Building materials of asphalt, asbestos and fiber cement, and unfired	921	1,078
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	r (1)	2
Coal, coke and briquets	185	116
Petroleum:		
Crude and partly refined [2] thousand 42-gallon barrels	103,762	113,265
Refinery products:		
Gasoline do	7	269
Kerosine and jet fuel do	747	984
Distillate fuel oil do	1	238
Residual fuel oil do	820	332
Lubricants do	43	69
Liquefied petroleum gas do	2	3
Other do	43	278
Mineral tar and other coal–, petroleum–, or gas–derived crude chemicals	r 67	81

r Revised.

[1] Less than ½ unit.

[2] Government of Trinidad and Tobago, Ministry of Petroleum and Mines.

The Mineral Industry of Central America Areas

By Burton E. Ashley[1]

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BRITISH HONDURAS

British Honduras joined the Caribbean Free Trade Association (CARIFTA) in 1971 in a move which was expected to strengthen its foreign trade and domestic industrial and agricultural position. As a member, it has a preferred position among the Commonwealth Caribbean countries for export of agricultural output. Generally, duty-free access will be available to the markets of Barbados, Guyana, Trinidad and Tobago, Jamaica, and a number of British Caribbean Islands. British Honduras was also granted the right, in principle, to have a limited association with the Central American Common Market.

The Caribbean Development Bank approved financing for part of Belize Electricity Board's 5-year development program to improve and extend service in the area around Belize.

An application for a development concession to build an oil refinery by a newly registered company, Belize Refining and Terminal Limited, was published in the official Government Gazette. The proposed refinery was to have a throughput of 100,000 barrels daily; the refinery completion was set for yearend 1974 and a minimum of 480 persons were to be employed.

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[1] Physical scientist, Division of Nonferrous Metals.

Table 1.—Central America Areas: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971[p]
BRITISH HONDURAS			
Limestone[e]	134,000	146,000	268,900
Marl[e]	93,000	105,000	90,000
Sand and gravel[e]	222,000	193,000	220,000
COSTA RICA			
Cement	158,459	178,500	212,532
Diatomite[e]	15,000	19,000	21,000
Fertilizer materials, manufactured:			
Nitrogenous, gross weight	36,000	40,000	57,149
Mixed and unspecified, gross weight	49,000	60,000	69,256
Gold[e] troy ounces	500	500	500
Lime[e]	8,000	10,400	11,000
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	510	488	694
Kerosine do	144	141	164
Distillate fuel oil do	894	839	1,266
Residual fuel oil do	570	527	858
Liquefied petroleum gas do	4	4	2
Salt, marine	8,864	7,551	10,950
Stone, sand and gravel:			
Limestone and other calcareous material[e]	240,000	250,000	391,000
Sand and gravel[e]	105,000	136,500	141,000
Other[e]	350,000	455,000	500,000
EL SALVADOR			
Aluminum metal, semimanufactures	907	908	970
Cement	141,713	166,694	167,000
Fertilizers, manufactured	60,911	64,565	NA
Gold, fine troy ounces	--	2,301	3,503
Gypsum	--	5,552	NA
Iron and steel: steel semimanufactures	32,942	16,662	17,443
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	575	305	784
Kerosine do	229	163	258
Jet fuel do	69	--	[1]81
Distillate fuel oil do	549	310	935
Residual fuel oil do	748	357	931
Liquefied petroleum gas do	74	50	173
Salt	27,228	31,357	30,432
Silver, fine troy ounces	--	153,516	215,210
Stone, limestone and seashells	209,910	387,686	275,800
GUATEMALA			
Antimony, mine output, metal content	100	261	1,771
Cement thousand tons	187	225	[e]225
Feldspar	2,000	2,500	[e]2,500
Gypsum	7,725	7,710	[e]7,900
Iron ore and concentrate[2]	3,000	1,618	NA
Lead:			
Mine output, metal content	[r]300	[r]500	[e]500
Metal including secondary	225	75	90
Lime	17,400	21,990	[e]22,000
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	1,281	936	1,512
Kerosine and jet fuel do	580	380	670
Distillate fuel oil do	1,586	1,562	1,517
Residual fuel oil do	1,759	1,702	1,691
Liquefied petroleum gas do	96	107	114
Quartz	10,900	17,770	NA
Stone, crushed and broken:			
Limestone thousand tons	590	312	NA
Dolomite	2,040	NA	NA
Volcanic ash	45,000	44,180	NA
Zinc, mine output, metal content	931	--	NA
HONDURAS			
Antimony, mine output, metal content	113	343	664
Cadmium, mine output, metal content	153	[r]49	70
Cement	131,727	150,549	[e]150,000
Gold troy ounces	6,223	3,333	2,701
Gypsum	7,659	9,205	[e]9,000
Lead, mine output, metal content	13,839	15,965	17,967
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	678	898	692
Jet fuel do	21	48	66
Kerosine do	182	230	288
Distillate fuel oil do	1,013	1,524	1,208
Residual fuel oil do	1,587	2,127	1,852
Other do	36	52	70
Refinery fuel and losses do	209	256	88
Total do	3,726	5,135	4,214
Salt	27,802	27,000	[e]27,800
Silver thousand troy ounces	3,905	3,816	3,642

See footnotes at end of table.

Table 1.—Central America Areas: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971 ^{p}
HONDURAS—Continued			
Stone:			
Dimension stone, marble	NA	1,401	NA
Crushed and broken	228,327	244,374	NA
Zinc, mine output, metal content	16,006	20,040	22,894
NICARAGUA			
Cement	109,046	136,000	73,795
Copper, mine output, metal content	4,158	3,361	3,662
Gold, mine output, metal content ... troy ounces	120,011	115,173	121,134
Gypsum and anhydrite, crude	30,000	^{e}30,000	25,210
Petroleum refinery products:			
Gasoline ... thousand 42-gallon barrels	660	927	890
Kerosine and jet fuel ... do	228	253	222
Distillate fuel oil ... do	673	933	968
Residual fuel oil ... do	614	922	1,105
Liquefied petroleum gas ... do	67	110	140
Salt, marine	NA	^{e}10,000	^{e}45,454
Silver, mine output ... troy ounces	247,148	216,838	260,666
PANAMÁ			
Cement	173,745	180,000	191,869
Clays and products:			
Crude n.e.s ... thousand cubic meters	NA	NA	114,683
Products ... do	NA	NA	152,911
Iron and steel: Magnetite sands (gross weight)	NA	NA	300,000
Lime ... thousand cubic meters	NA	NA	2,294
Stone, sand and gravel:			
Limestone ... do	NA	NA	4,129
Other ... do	138	NA	703,391
Salt	11,426	7,110	7,866
Petroleum refinery products:			
Gasoline ... thousand 42-gallon barrels	3,100	3,280	3,012
Kerosine and jet ... do	2,497	^{e}1,735	2,776
Distillate fuel oil ... do	5,581	5,240	2,527
Residual fuel oil ... do	12,239	12,650	17,396
Other ... do	1,878	2,185	1,251
Refinery fuel and loss ... do	894	910	1,873

^{e} Estimate. ^{p} Preliminary. ^{r} Revised. NA Not available.

[1] Sales.

[2] Used in cement manufacture, except for 18 tons in 1970.

Table 2.—British Honduras: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1968	1969	Principal destinations, 1969
Cement	45	195	Guatemala 128; Mexico 67.
Fertilizer materials: Manufactured	1	2	All to Guatemala.
Iron and steel:			
Metals:			
Scrap	1,143	281	All to Mexico.
Semimanufactures	36	13	Mexico 13.
Petroleum refinery products:			
Gasoline ... thousand 42-gallon barrels	19	39	Ship stores 38.
Kerosine ... do	7	2	Ship stores 2.
Distillate fuel oil ... do	8	2	Ship stores 2.
Lubricants ... do	2	(1)	

[1] Less than ½ unit.

Table 3.—British Honduras: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1968	1969	Principal sources, 1969
METALS			
Aluminum metal including alloys, all forms	NA	124	Jamaica 57; United Kingdom 49; United States 18.
Copper metal including alloys, all forms	NA	2	United Kingdom 2.
Iron and steel, semimanufactures	2,811	1,894	United Kingdom 1,183; Luxembourg 134; United States 118.
Lead metal including alloys	NA	2	United States 2.
Tin metal including alloys, all forms..long tons	NA	3	France 2; United States 1.
Zinc metal including alloys, all forms	NA	1	United States 1.
Base metals including alloys, all forms, n.e.s	104	--	
NONMETALS			
Cement	18,588	14,156	Jamaica 10,421; Honduras 3,557; United Kingdom 148.
Clays and products (including all refractory brick):			
Refractory (including nonclay bricks)	--	109	Mexico 81; United Kingdom 14; Belgium 7.
Nonrefractory	--	11	United Kingdom 6; Mexico 3; United States 2.
Fertilizer materials:			
Manufactured:			
Nitrogenous	1,330	1,625	Trinidad 660; Netherlands 264; United States 261.
Phosphatic	638	1,305	United States 1,270; Netherlands 20; West Germany 15.
Potassic	379	249	United States 146; France 91; West Germany 10.
Other including mixed	2,336	3,147	United States 1,881; Jamaica 1,092; West Germany 91.
Lime	803	244	United Kingdom 181; Mexico 40; Netherlands 21.
Salt	684	599	United Kingdom 495; Netherlands 91; United States 13.
Stone, sand and gravel	--	5	United States 3; Guatemala 1.
MINERAL FUELS AND RELATED MATERIALS			
Coal and coke including briquets	22	7	United States 4; United Kingdom 3.
Petroleum refinery products:			
Gasoline...thousand 42-gallon barrels	90	134	Jamaica 97; Aruba 19; Trinidad 14.
Kerosine.....do	37	60	Jamaica 45; Aruba 6; Honduras 5.
Distillate fuel oil.....do	108	124	Jamaica 92; Trinidad 24; Aruba 8.
Residual fuel oil.....do	23	35	All from Guatemala.
Lubricants.....do	7	19	NA.
Other.....do	17	1	NA.

NA Not available.

COSTA RICA

The bauxite-alumina project sponsored by Alcoa of Costa Rica, Inc., and the Government of Costa Rica was progressing. Preliminary infrastructure was in the planning stage. There was some possibility that the project would be enlarged as a multinational effort to produce aluminum metal rather than alumina for export.

Table 4.—Costa Rica: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum metal including alloys, all forms	18	95	Guatemala 51; Nicaragua 20; Honduras 13.
Iron and steel including alloys, all forms	9,601	6,104	Nicaragua 2,495; Guatemala 1,165; El Salvador 1,021.
Lead metal including alloys, all forms	14	--	
Other metals, nonferrous, all forms, n.e.s	92	97	United States 65; West Germany 24; Nicaragua 8.
NONMETALS			
Abrasives, natural	--	3	All to Nicaragua.
Asbestos	24	10	Do.
Cement	272	6	Do.
Clays and products	135	156	Nicaragua 112; Honduras 31.
Diatomite and other infusorial earths	r 33	33	El Salvador 30; Panamá 3.
Fertilizer materials, manufactured:			
Nitrogenous	14,077	13,110	Mexico 5,040; El Salvador 3,504; Guatemala 1,945; Nicaragua 1,359.
Phosphatic	--	20	All to Nicaragua.
Other including mixed	27,660	19,309	Panamá 11,354; Honduras 3,297; Nicaragua 2,955.
Gypsum	r (1)	--	
Lime	16	39	All to Panamá.
Pigments, mineral, crude	r 40	41	Nicaragua 25; Honduras 9; Panamá 7.
Salt	22	12	All to Nicaragua.
Stone, sand and gravel:			
Dimension stone	40	158	Panamá 150; Guatemala 8.
Other stone	207	203	Nicaragua 150; Honduras 53.
Sand and gravel	1	--	
Other nonmetals, n.e.s	r 1	--	
MINERAL FUELS AND RELATED MATERIALS			
Petroleum refinery products thousand 42-gallon barrels	114	355	Panamá 208; Canal Zone 119; United States 28.

r Revised.

(1) Less than ½ unit.

Source: Ministerio de Industria y Comercio, Dirección General de Estadístico y Censos. Comercio Exterior de Costa Rica. San José, Costa Rica, 1969, 520 pp; 1970, 532 pp.

Table 5.—Costa Rica: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum including alloys, all forms	1,264	2,313	Panamá 1,149; El Salvador 341; Switzerland 152.
Copper:			
Copper sulfate	29	22	United Kingdom 13; United States 5; West Germany 4.
Metal including alloys, all forms	311	445	Mexico 197; Japan 78; United States 69.
Iron and steel:			
Scrap	--	6	Panamá 4; Mexico 2.
Pig iron, ferroalloys, and similar materials	r 17	29	West Germany 25; United Kingdom 2; United States 2.
Steel, primary forms	18,074	22,657	Belgium-Luxembourg 12,817; United States 4,221; West Germany 2,901.
Semimanufactures	67,344	72,102	Japan 29,341; West Germany 11,121; Belgium-Luxembourg 9,878.
Lead including alloys, all forms	117	132	West Germany 33; United States 31; Japan 21; Belgium-Luxembourg 20.
Nickel including alloys, all forms	5	4	West Germany 2; United States 2.
Platinum-group metals including alloys, all forms troy ounces	3,922	8,038	All from United States.
Silver including alloys all forms do	8,295	27,489	Mainly from United States.
Tin including alloys, all forms long tons	29	27	West Germany 9; United States 9; Netherlands 5.
Zinc including alloys, all forms	1,453	2,624	Japan 977; Mexico 924; Nicaragua 447.
Other:			
Ore and concentrate of base metals, n.e.s	224	535	Mainly from United States.
Metals including alloys, all forms	24	7	Do.

See footnote at end of table.

Table 5.—Costa Rica: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
NONMETALS			
Abrasives, natural, n.e.s	46	50	West Germany 16; United States 16; Italy 6.
Asbestos	457	736	Canada 558; United States 168.
Boron materials, oxide and acid	r 26	31	United States 24; West Germany 4; Netherlands 3.
Cement	3,275	6,699	Japan 2,370; Nicaragua 1,599; Mexico 1,280.
Clays and products (including refractory brick):			
Crude	767	962	United States 606; United Kingdom 323.
Products	5,967	5,967	Nicaragua 4,548; United States 881.
Diamond, industrial carats	90,000	470,000	Mainly from United States.
Diatomite and other infusorial earths	440	218	United States 203; Mexico 14.
Feldspar, fluorspar, and cryolite	9	181	United States 165; Nicaragua 16.
Fertilizer materials, crude and manufactured:			
Nitrogenous	67,860	52,985	United States 16,193; Colombia 11,178; West Germany 9,531.
Phosphatic	17,894	24,462	United States 19,337; Colombia 4,062; Netherlands 758.
Potassic	25,134	21,401	United States 17,470; West Germany 3,545; Panamá 358.
Other including mixed	16,612	40,975	Netherlands 13,098; West Germany 9,665; United States 6,593.
Graphite, natural	23	4	West Germany 2; Ceylon 1.
Gypsum and plasters	5,408	6,724	Nicaragua 6,539; West Germany 127.
Lime	9	225	Nicaragua 206; United States 11.
Mica, all forms	(1)	1	All from United States.
Pigments, mineral, including processed iron oxides	3	3	Mainly from Belgium-Luxembourg.
Precious and semiprecious stones, except diamond kilograms	87	141	West Germany 78; United States 39.
Salt including brine	3,925	9,637	Nicaragua 4,856; El Salvador 3,048; Honduras 1,230.
Stone, sand and gravel	181	372	Italy 194; Guatemala 117; Mexico 27.
Sulfur, elemental, all forms	47	98	West Germany 45; Japan 26; United Kingdom 18.
Talc, steatite, soapstone, and pyrophyllite	257	333	Italy 200; United States 53; West Germany 31.
Other nonmetals n.e.s	4	(1)	All from United States.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt, native	--	2	All from Panamá.
Carbon black and gas carbon	465	951	Colombia 468; Venezuela 294.
Coal and coke including briquets	176	253	West Germany 109; United States 102; Netherlands 37.
Natural gas liquids thousand 42-gallon barrels	53	69	Venezuela 35; Nicaragua 23.
Petroleum:			
Crude and partly refined do	2,281	2,232	All from Venezuela.
Refinery products:			
Gasoline do	155	263	Venezuela 144; Curaçao and Aruba 68.
Kerosine do	74	84	Curáçao and Aruba 56; United States 12.
Distillate fuel oil do	183	492	Venezuela 375; Panamá 58.
Lubricants do	83	87	Mainly from United States.
Mineral jelly and wax do	16	18	Do.
Other: Bitumen and other residues do	r 53	72	Mainly from Venezuela.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	526	653	Mainly from United States.

r Revised.

[1] Less than ½ unit.

Source: Ministerio de Industria y Comercio, Dirección General de Estadística y Censos, Comercio Exterior de Costa Rica, San José, Costa Rica, 1969, 520 pp; 1970, 532 pp.

COMMODITY REVIEW

Metals.—*Aluminum, Alumina, and Bauxite.*—It was reported that contracts had been awarded by Alcoa of Costa Rica, Inc., and the Costa Rican Government, for port and highway design for the planned bauxite-alumina project. Estimated cost of the preliminary construction work was set at $119 million.

President Figueres, in a speech given in December, outlined a somewhat larger scheme to carry the bauxite-alumina stage through to aluminum metal. The President's plan included refining capacity for 500,000 tons of aluminum per year, and installation of hydropower to supply the plant and domestic needs, with a surplus for possible sale to Panamá and Nicaragua. Flood control projects and irrigation programs would be incorporated in the hydropower projects. Generating equipment might be supplied by the U.S.S.R. under a barter arrangement for Costa Rican commodities. The World Bank was mentioned as a possible source of financing.

Metales Industriales de Costa Rica began export of semifinished products to other countries of Central America. Plant capacity was 2.5 million square feet of sheets, and 4 million linear feet of sections annually.

Mineral Fuels.—*Petroleum.*—It was reported that Allied Chemical Corp., which owns 85 percent of Refinadora Costarricense de Petróleo S.A., had given an option for the sale of its interest to Pan American Shipbuilding and Dry Dock Company.

Costa Rica and Bolivia signed an economic and technical cooperation agreement which included the possible exchange of 2,000 barrels of Bolivian crude oil annually in exchange for fertilizer from Costa Rica.

EL SALVADOR

The study of geothermal resources carried out jointly by the United Nations and the Government was completed. It was concluded that there were 18 geothermal areas in the country which could provide energy as a substitute for petroleum imports with a consequent savings of much foreign exchange. Total reserve capacity for geothermal sites was estimated at 5,000 megawatts.

A geothermal station of 30 megawatts could be completed by 1973 or 1974, which would cut petroleum imports by an estimated $1 million. The Government reportedly approved the expenditure of $10 million for construction of the plant.

Table 6.—El Salvador: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum metal	943	960
Copper metal	2	1
Iron and steel:		
Ore and concentrate	5	--
Metal ingots and semimanufactures	14,461	13,438
Silver metal troy ounces	--	137,669
Tin metal long tons	NA	4
Zinc metal	20	(1)
Other nonferrous metals	168	220
NONMETALS		
Cement	48,525	12,905
Clays and products	291	42
Diatomaceous earth	1	--
Fertilizer materials, crude and manufactured	[r] 36,007	36,965
Gypsum	1	--
Lime	NA	26
Salt	9,860	11,061
Sodium compounds	1	73
Stone, sand and gravel	394	940
MINERAL FUELS AND RELATED MATERIALS		
Coal and coke	10	--
Gas, liquefied petroleum thousand 42-gallon barrels	33	5
Petroleum refinery products do	678	40

[r] Revised. NA Not available.

[1] Less than ½ unit.

Table 7.—El Salvador: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum metal including alloys:		
Unwrought	1,172	921
Semimanufactures	883	1,295
Copper:		
Copper sulfate	4	6
Metal including alloys, all forms	922	1,245
Iron and steel:		
Metal:		
Scrap	125	301
Pig iron, ferroalloys, and similar materials	219	103
Steel, primary forms	31,693	21,635
Semimanufactures	35,950	24,448
Other	10	7
Lead metal including alloys:		
Unwrought	123	117
Semimanufactures	181	170
Nickel metal including alloys, all forms	(1)	1
Platinum-group metals	--	514
Silver metal including alloys	4,919	2,122
Tin metal including alloys:		
Unwrought long tons	4	2
Semimanufactures do	13	23
Zinc metal including alloys, semimanufactures	893	479
Other:		
Ore and concentrate	--	1
Ash and residue containing nonferrous metals	21	9
Base metals including alloys n.e.s	11	1
NONMETALS		
Abrasives, natural	6	8
Asbestos	754	963
Boron materials, oxide and acid	4	6
Cement	49,867	16,576
Clays and products (including all refractory brick):		
Crude:		
Kaolin	781	949
Other	81	146
Products	1,321	1,482
Diamond, industrial carats	60,000	110,000
Diatomite and other infusorial earths	499	319
Feldspar and fluorspar	--	39
Fertilizer materials, crude and manufactured:		
Nitrogenous	100,244	170,692
Phosphatic	32,077	11,628
Potassic	3,293	3,564
Other including mixed	53,764	53,407
Graphite, natural	2	1
Gypsum and plasters	3,758	93
Lime	1,669	2,050
Mica all forms	11	2
Precious and semiprecious stones; except diamond kilograms	47	129
Salt (excluding brine)	121	76
Sodium and potassium compounds, n.e.s	3,237	4,831
Stone, sand and gravel:		
Dimension stone	4,444	3,560
Gravel and crushed rock	1,237	27
Other	3,986	1,007
Sulfur, elemental, all forms	3,256	2,600
Talc, soapstone, and pyrophyllite	100	129
Other nonmetals, n.e.s	332	216
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	5,631	5,509
Coal and coke, including briquets	367	324
Natural gas liquids thousand 42-gallon barrels	28	43
Petroleum:		
Crude and partly refined do	2,195	1,623
Refinery products:		
Gasoline do	59	66
Kerosine do	14	230
Gas oil, diesel oil do	2	(1)
Lubricants do	33	54
Mineral jelly and wax do	14	18
Other: Bitumen and other residues do	1	45
Mineral tar and other coal–, petroleum–, or gas–derived crude chemicals	145	44

[1] Less than ½ unit.

COMMODITY REVIEW

Metals.—*Gold and Silver.*—Cía Minera San Cristobal, S.A., also called El Divisadero, planned to increase ore production to 4,000 tons per month. Assay values were reported at 0.07 ounce of gold and 5 to 8 ounces of silver per ton. The operation, which provided work for 250 persons, was described as satisfactory. The mine is owned by Instituto Salvadoreño de Fomento Industrial (INSAFI).

Other gold and silver mines known to be operating in the country were Compañía Minera de Oriente in the Department of San Miguel and Cía. Minera San Sebastian, S.A.

GUATEMALA

The National Institute of Electrification (INDE), which has the responsibility for supplying energy to Guatemala, was satisfying the growing demand by adding thermal plants. In an attempt to conserve the foreign exchange necessary to import fossil fuels, and to provide a more satisfactory source of energy, INDE was undertaking preliminary studies toward the possible development of potential geothermal energy sources which were believed to exist in the southeastern and southwestern parts of the country.

The agreement for development of the Lake Izabal nickel deposits was signed by the Government and the operating company, Exploraciones y Explotaciones Mineras Izabal, S.A. (EXMIBAL). International financing remained to be arranged.

Some petroleum exploration activity was in progress in the Department of Petén; other concessions were held in areas of eastern Guatemala where production, if developed, could handily supply the fuel requirements of EXMIBAL.

Table 8.—Guatemala: Apparent exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1970	Principal destinations, 1970
Copper metal including alloys:		
Scrap	546	West Germany 404; United States 142.
Unwrought and semimanufactures	89	Belgium-Luxembourg 89.
Lead:		
Ore and concentrate	124	All to Japan.
Metal including alloys, all forms	150	All to Italy.
Zinc:		
Ore and concentrate	1,012	All to Japan.

Source: Statistical Office of the United Nations, 1970 Supplement to the World Trade Annual. V. 2, (South and Central America, including the Caribbean and Bermuda), Walker and Company, New York, 1972, pp. 501–514.

COMMODITY REVIEW

Metals.—*Copper.*—Finabai, S.A., a wholly owned international financing subsidiary of the Banca d'America d'Italia was reported heading a consortium to provide Basic Resources International Ltd. with $5.5 million to finance its exploration and development program.[2] Projects would include copper, nickel, and petroleum prospects.

Mill construction for the Oxec property was to be started with completion planned for 1973. Mill capacity was projected for 1,000 tons per day. Reserves, which must be mined by underground methods, were estimated at 1.3 million tons averaging 2.6 percent copper. Oxec was discovered in 1967 by Basic Resources International Ltd.

Nickel.—On February 26, 1971, the agreement between the Guatemalan Government and EXMIBAL was published in Guatemalteco, the Government's official journal. The Government will have a 30-percent equity participation in the company; EXMIBAL gave up 50 percent of its exemption from income taxes.

EXMIBAL will operate under the mining law and invest a specified amount of money. Conditions were agreed upon for various obligations to the employees, transportation of the nickel product, and some other financial obligations. Antipollution standards as well as standards for restoring strip-mined lands were set. Cost of the project was estimated at $250 million to produce about 60 million pounds of nickel annually. Including support industries, the project could provide 3,000 jobs.[3]

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[2] Mining Journal (London). V. 277, No. 7093, July 30, 1971, p. 97.

Mineral Fuels.—*Petroleum.*—Negotiations were in progress with two United States oil companies for exploration in the Department of Petén in the north of Guatemala. Most of the old concessions in the area lapsed and new agreements were being made. One contract called for the drilling of at least two wells on a 400,000-hectare spread north and west of Flores; the other contract called for a minimum of three wells on a 400,000 hectare concession south of Flores between Poctún and Sayaxché. Other firms were reportedly interested in the general area. Agreements were being made under the auspices of Petroguat, the Guatemala Government petroleum entity of the Ministry of Mines and Hydrocarbons.

A concession comprising 262,000 hectares in eastern Guatemala was being examined for the purpose of providing fuel oil to the proposed nickel mining/refining plant at Lake Izabal. The concession covers the eastern Guatemalan coast line, both onshore and offshore, blocks along the Rio Dulce, and the eastern portion of Lake Izabal.

It was also reported that drilling was planned by Esso Standard Guatemala S.A., about 36 miles off the Pacific coast village of Sipacate.

Information about work at Las Tortugas, from which shows of oil have been previously reported, was indefinite. The area of interest is located in the northeast corner of the Department of Quiché; no new discoveries were reported during the year.

Table 9.—Guatemala: Apparent imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1970	Principal sources, 1970
METALS		
Aluminum metal including alloys, all forms	758	United States 250; West Germany 172; Japan 116; Greece 70.
Copper metal including alloys, all forms	43	United States 17; Canada 15; West Germany 11.
Iron and steel metal:		
Steel, primary forms	11,999	United States 7,164; Japan 2,759; Belgium-Luxembourg 2,076.
Semimanufactures:		
Bars, rods, angles, shapes, sections	11,132	Belgium-Luxembourg 4,477; France 2,726; United States 2,291.
Universals, plates and sheets	35,186	Japan 30,319; West Germany 1,248; Belgium-Luxembourg 1,173; United States 1,112.
Hoop and strip	2,418	Japan 1,098; United Kingdom 689; Belgium-Luxembourg 335.
Wire	2,252	United States 957; Belgium-Luxembourg 570; Japan 398.
Tubes, pipes and fittings	6,646	United States 2,708; United Kingdom 1,223; France 1,191; West Germany 1,104.
Castings and forgings, rough	266	All from the United States.
Lead metal including alloys, all forms value, thousands	$42	NA.
Manganese, ore and concentrates	594	All from United States.
Nickel metal including alloys, all forms value, thousands	$27	NA.
Tin metal including alloys, all forms long tons	8	All from United States.
Titanium oxides	1,437	Belgium-Luxembourg 988; United States 238; Japan 211.
Zinc metal including alloys, all forms	511	All from Japan.
NONMETALS		
Asbestos	499	All from Canada.
Cement	1,305	All from Japan.
Clays and products (including all refractory brick):		
Crude n.e.s	2,041	All from United States.
Products value, thousands	$299	United States $219; United Kingdom $32.
Fertilizer materials: Manufactured	41,832	United States 15,816; West Germany 11,862; Belgium-Luxembourg 7,730.
Sodium and potassium compounds, n.e.s.:		
Caustic soda	352	All from United States.
MINERAL FUELS AND RELATED MATERIALS		
Carbon black	724	United States 538; Japan 186.
Gas hydrocarbon: Natural cubic meters	5,076	All from United States.
Petroleum refinery products value, thousands	$2,632	United States $2,528; Japan $56; West Germany $25.

Source: Statistical Office of the United Nations 1970 Supplement to the World Trade Annual. V. 2 (South and Central America, including the Caribbean and Bermuda), Walker and Company, New York, 1972, pp. 498–500.

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[3] Wall Street Journal. V. 77, No. 41, Mar. 2, 1972, p. 5.

HONDURAS

Mining in Honduras in 1971 more or less marked time. The most active mining property in the country showed better operating results, but a number of factors prevented a widening of profit margins.

Asarco Exploration Co., an affiliate of American Smelting & Refining Co., suspended its activities and closed its offices in Honduras.

Star of Honduras, S.A. was registered by predominantly U.S. interests. The company reportedly had mining concessions totaling 16,000 hectares on which preliminary geological work had been done. Minerals in which the company was interested were not specified.

Port facilities on the Caribbean were to be expanded and improved, and a deep-water port was to be established on the Pacific coast. Puerto Cortés, on the Caribbean, was to have two more deep-water berths and necessary equipment; in addition, new railway yards were to be added as well as a new tug boat, pilot boat, and engineering consultant services. The deep-water port on the Pacific was to be built at Henecan on the Gulf of Fonseca. A two-berth wharf was planned with necessary components for operation.

Total cost of the two projects was estimated at $9.8 million, of which the International Bank for Reconstruction and Development (IBRD) was to loan $6.0 million; term of the loan was 20 years at 7.25 percent per year, with a 4-year grace period.

The largest single project of the National Electricity enterprise was for a hydroelectric facility at El Cajón. The site is a canyon of about 100 meters width with nearly vertical walls 100 meters high. The dam is planned for a height of 225 meters, one of the highest in the Western Hemisphere. Original installed capacity was to be 250 megawattts; total cost of $92 million included new transmission lines, substations and interest payments during construction. Loan assistance from the IBRD, or other sources, was anticipated.

Table 10.—Honduras: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum	--	17	Guatemala 11, Nicaragua 5.
Antimony, ore and concentrate	55	--	
Cadmium, ore and concentrate	162	205	Mainly to United States.
Copper, ore and concentrate	11	(1)	All to Italy.
Gold, metal, worked or unworked troy ounces	[r] 2,701	2,733	NA.
Iron and steel, metal and alloys, all forms	1,173	171	British Honduras 85; United States 64; Nicaragua 17.
Lead, ore and concentrate	12,771	16,429	United States 16,097.
Silver:			
Ore and concentrate thousand troy ounces	3,191	3,648	Mainly to United States.
Metal including alloys do	504	624	All to United States.
Zinc:			
Ore and concentrate	16,289	18,175	United States 17,789.
Other:			
Ash and residue, containing nonferrous metals	136	89	United Kingdom 42; United States 21; West Germany 18.
Metals including alloys, all forms	224	45	West Germany 35; Belgium 10.
NONMETALS			
Cement	14,315	6,614	British Honduras 5,593; Netherlands 1,020.
Clays and products	51	--	
Gypsum and plasters	1,498	(1)	All to Nicaragua.
Lime	10	--	
Salt	4,652	4,003	Nicaragua 2,555; Costa Rica 1,428.
Stone, sand and gravel:			
Dimension stone	65	34	Nicaragua 23; Costa Rica 11.
Other	129	--	
Other nonmetals	--	1	All to Guatemala.
MINERAL FUELS AND RELATED MATERIALS			
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	298	284	Dominican Republic 264; Trinidad and Tobago 15.
Kerosine do	--	1	All to Jamaica.
Distillate fuel oil do	324	525	Panama Canal Zone 266; Panama 93; United States 90.
Residual fuel oil do	1,284	1,666	Panama Canal Zone 997; Panama 457.
Lubricants do	[r] (1)	(1)	Mainly to Guatemala.
Liquefied petroleum gas 42-gallon barrels	93	1,891	British Honduras 1,786; Nicaragua 104.

[r] Revised. NA Not available.

[1] Less than ½ unit.

Table 11.—Honduras: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum metal including alloys, all forms	509	683	Mainly from United States.
Copper:			
Copper sulfate	149	118	United States 72; Canada 46.
Metal including alloys, all forms	107	313	Mainly from United States.
Iron and steel metal including alloys, all forms	35,186	40,342	United States 16,838; Belgium 7,548; West Germany 4,478.
Lead metal including alloys	52	61	Mainly from United States.
Nickel metal including alloys	--	(1)	All from West Germany.
Platinum-group metals troy ounces	--	3,022	All from United States.
Silver metal including alloys, all forms do	1,511	2,636	Mainly from United States.
Tin metal including alloys, all forms long tons	10	13	Do.
Zinc metal including alloys	53	46	Do.
Other:			
Ore and concentrate	9	(1)	Mainly from Dominican Republic.
Ash and residue, containing nonferrous metals	1	5	All from United States.
Metals including alloys, all forms	10	7	Mainly from United States.
NONMETALS			
Abrasives, natural	27	7	Guatemala 3; Czechoslovakia 1; United States 1.
Asbestos	285	1,832	Mainly from Canada.
Cement	4,499	1,392	West Germany 572; Denmark 398; Belgium 222.
Clays and products (including all refractory brick):			
Crude, kaolin and other clays or earths	427	637	Mainly from United States.
Products including nonclay brick	1,562	1,195	Nicaragua 350; United States 335; Japan 115.
Diatomite and other infusorial earths	509	1,498	Mainly from Nicaragua.
Fertilizer materials, crude and manufactured	35,260	35,754	West Germany 12,914; United States 6,929; United Kingdom 3,818; Costa Rica 3,380.
Graphite, natural	--	2	Mainly from West Germany.
Gypsum and plasters	31	31	United States 23; West Germany 8.
Lime	322	737	Mainly from United States.
Precious and semiprecious stones, except diamond troy ounces	836	932	Do.
Salt	553	815	Do.
Sodium and potassium compounds	1,088	1,644	United States 569; France 565; Belgium 187.
Stone, sand and gravel:			
Dimension stone, crude and partly worked	478	211	Mainly from Guatemala.
Sand, quartz, and other rock	150	128	United States 88; Nicaragua 35.
Sulfur, elemental all forms	682	954	West Germany 511; United States 346.
Talc and steatite	59	47	Italy 19; United Kingdom 19.
Other nonmetals, n.e.s	2	--	
MINERAL FUELS AND RELATED MATERIALS			
Asphalt, natural	1	--	
Coal and coke including briquets	347	398	Mainly from United States.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	3,495	4,419	Mainly from Venezuela.
Refinery products:			
Gasoline do	271	79	Mainly from Netherlands Antilles.
Kerosine and jet fuel do	55	2	Mainly from United States.
Gas oil, diesel oil do	439	323	Mainly from Netherlands Antilles.
Residual fuel oil do	4	--	
Lubricants do	51	45	United States 31; Netherlands Antilles 8.
Mineral jelly and wax do	7	11	Mainly from United States.
Gas, hydrocarbons, natural 42-gallon barrels	5,638	70	Mainly from Belgium.
Other thousand 42-gallon barrels	r 33	108	Mainly from United States.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	5,966	3,715	Do.

r Revised.

[1] Less than ½ unit.

COMMODITY REVIEW

Metals.—*Gold.*—United Siscoe Mines, Ltd. started a drilling program and the reconditioning of adits at the Clavo Rico property. The first core-drill hole was reportedly abandoned at a depth of 400 feet but had intersected values up to 0.205 ounce of gold per ton between 289 and 297.3 feet. A second hole had been started. Channel sampling of one of the adits gave gold values averaging 1.52 ounces over a length of 90 feet and a width of 12 feet.[4]

Iron and Steel.—Construction work for the iron and steel plant of Altos Hornos de Centro America will take about 3 years; operations were expected to start in 1975. A multinational group was to be formed to develop trade in the plant's products throughout Central America. Initial investment in the plant was estimated at $18 million with later expansion to raise the total to $50 million. The plant was to be located at Agalteca, north of Tegucigalpa.

Silver, Gold, Lead, Zinc.—New York and Honduras Rosario Mining Co. (NYH) continued operations at its El Mochito mine. The mill processed 311,310 tons of ore, a record for the mine and an increase of more than 15 percent over the 1970 total. Improvements were also made in mining and metallurgy which resulted in a slight decline in operating costs. Improvements were offset by decreased silver prices, the lower grade of ore available and increased smelter charges. The temporary surcharge applied to imports to the United States cost NYH about $225,000.

Production from the El Mochito mine in 1971 is shown in the following tabulation:

	Silver (ounces)	Gold (ounces)	Lead (tons)	Zinc (tons)
Lead concentrates	2,085,826	1,287	16,717	2,478
Zinc concentrates	1,034,046	1,013	2,439	21,922
Doré bullion	389,020	401	--	--
Total	3,508,892	2,701	19,156	24,400

Ore milled contained 12.3 ounces of silver and 0.011 ounce of gold per ton; lead content was 7.34 percent per ton and zinc content 8.51 percent. Assured and probable reserves at yearend 1971 totaled slightly more than 2 million tons, assaying per ton: 12.6 ounces of silver, 0.009 ounce of gold, 10.87 percent lead, and 11.70 percent zinc.

Diamond drilling continued in the Porvenir–Yojoa area with favorable results. Work on the low-grade "San Juan" area blocked out 2.6 million tons of reserves which were considered marginal; assays of the deposit were silver, 2.8 ounces per ton; gold, 0.003 ounce per ton; lead, 2.86 percent; zinc, 7.44 percent; and copper, 0.34 percent.

Cía. Minera Bell Western de Honduras S.A. de C.V., a subsidiary of Bell Western Corp., obtained a mineral concession of about 30,000 acres to prospect for silver, gold, copper, and iron ore. Preliminary geological work was done and future plans include aerial and surface reconnaissance and core drilling when justified.

Mineral Fuels. — *Petroleum.* — Columbia Oil Co. (Japanese interests) and Signal Oil Co. drilled a wildcat test about 150 miles northeast of Puerto Lempira. Drilled in 150 feet of water, the test was dry and abandoned at 7,000 feet.

Mobil Oil Co. planned two tests about 135 miles northwest of Cabo Gracias a Dios. The Dinamita No. 1 was scheduled for a depth of 10,000 feet, and the Turqueza No. 1, for 7,000 feet.

NICARAGUA

In dedicating Nicaragua's new lead-zinc mine, President Somoza stressed the policy of welcome collaboration between the Government and private foreign investment. Policy to encourage incoming capital and technology was recognized as essential to contribute to the country's attainment of its development goals.

COMMODITY REVIEW

Metals.—*Copper.*—Shareholders of La Luz Mines Limited were notified during November 1971 that the Rosita Mine was being put on a salvage basis. All exploration work was suspended and maintenance was reduced to meet the curtailed mining, milling, and freighting operations. The work force was reduced by 366 employees, or 40 percent. It was expected that salvage operations would continue to about the end of 1972.

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[4] Mining Journal (London). V. 277, No. 7104, Oct. 15, 1971, p. 348.

For the year ended September 30, 1971, La Luz operated at a net loss of $2.5 million after extraordinary items of $2.0 million. The loss before the extraordinary item was $507,922 (32 cents per share) compared with the previous year's profitable result of $544,922, or 34 cents per share. Contributing to the company's unfavorable result was the drop in grade of copper in ore from 1.04 percent to 0.63 percent, and the decline in average price per pound received for copper from 63.4 cents to 49.5 cents. The 20,347 tons of concentrate produced during the fiscal year ending September 30, 1971, contained 8,074,702 pounds of copper, 16,768 ounces of gold, and 108,779 ounces of silver. Gross value of all metals was $4.8 million, while net value amounted to $3.2 million. Operating profit in 1971 was $177,272 compared with the 1970 operating profit of $910,725.

Falconbridge Nickel Mines Ltd. announced that it had agreed to sell its 55.6 percent holding in La Luz Mines Limited.[5]

Gold.—Empresa Minera de el Setentrion, in which Noranda Mines Ltd. had a 61-percent interest, produced and treated 119,000 tons of ore averaging 0.69 ounce of gold per ton. The 900-foot drainage level in the Panteon section of the mine was completed, and progress was made in solving hot-water problems as well as upper-level ventilation. Proven ore reserves were about 218,000 tons of ore averaging 0.57 ounce of gold per ton. Noranda received dividends of $854,000 of the total $1.4 million paid during the year.

Zinc, Lead.—Neptune Gold Mining Co.'s Vesubio mining operation, owned 51.8 percent by American Smelting & Refining Company, was dedicated October 30, 1971, but production started in September. New York and Honduras Rosario Mining Co. and Price Co., Ltd., are also beneficial stockholders. Vesubio is located in the northeastern part of the country in the vicinity of Bonanza. Total cost of commissioning the mine was put at $3.0 million.

A vertical shaft reached the ore body at at depth of 715 feet. Reserves were reported at 1.2 million tons, averaging 12.58 percent zinc, 2.16 percent lead, 0.28 percent copper, 0.09 ounce of gold, and 0.48 ounce of silver per ton. The concentrator should produce about 2,800 tons of zinc concentrate and 500 tons of lead concentrate

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[5] La Luz Mines Ltd. 33d Annual Report. Fiscal year Sept. 30, 1971, 8 pp.

Table 12.—Nicaragua: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970[1]	Principal destinations, 1970
METALS			
Aluminum metal including alloys, all forms	55	171	All to Italy.
Copper:			
Ore and concentrates	19,237	12,884	All to West Germany.
Metal including alloys: Scrap	NA	273	Do.
Gold metal unworked or partly worked troy ounces	107,673	[2] 47,262	
Iron and steel metal:			
Scrap	34	NA	
Steel, primary forms: Ingots	10	542	All to Italy.
Semimanufactures	3,726	NA	
Silver metal including alloys troy ounces	168,052	NA	
Other metals including alloys, all forms	625	NA	
NONMETALS			
Cement	181	NA	
Clays, crude	7	NA	
Lime	(3)	NA	
Salt	3,343	NA	
Stone, sand and gravel	11,594	NA	
Other nonmetallic minerals	330	NA	
MINERAL FUELS AND RELATED MATERIALS			
Gas, liquefied petroleum	448	NA	
Petroleum products 42-gallon barrels	8	NA	

NA Not available.

[1] Statistical Office of the United Nations. Supplement to the World Trade Annual, 1970. V. 2 (South and Central America, including the Caribbean and Bermuda), Walker and Company, New York, 1972, pp. 529–531.

[2] U.S. imports, metal content of ore and base bullion.

[3] Less than ½ unit.

Table 13.—Nicaragua: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970[1]	Principal sources, 1970
METALS			
Aluminum metal including alloys, all forms	852	942	United States 777; Japan 68; Canada 67.
Copper:			
Copper sulfate	2	NA	
Metal including alloys, all forms	68	94	United States 47; Canada 28; West Germany 19.
Iron and steel:			
Metal:			
Scrap	1	NA	
Pig iron, ferroalloys and similar materials	101	NA	
Steel, primary forms	5,325	6,320	United States 5,239; Japan 1,081.
Semimanufactures	48,251	29,991	Japan 9,312; United States 8,169; Belgium-Luxembourg 4,761.
Lead metal including alloys	131	71	All from Denmark.
Silver metal including alloys, all forms troy ounces	5,081	NA	
Tin metal including alloys, all forms long tons	24	[2] $35,000	NA.
Zinc metal including alloys, all forms	1,135	219	All from Japan.
Other metals including alloys	12	NA	
NONMETALS			
Abrasives, natural	4	[2] $35,000	NA.
Asbestos	154	236	All from Canada.
Barite and witherite	NA	1,180	All from United States.
Cement	2,907	1,919	Do.
Clays and products (including all refractory brick):			
Crude	4,180	4,247	United States 3,461; United Kingdom 786.
Products	866	[2] $140,000	Mainly from United States.
Feldspar and fluorspar	NA	670	All from United States.
Fertilizer materials: Manufactured:			
Nitrogenous	12,195	13,866	Belgium-Luxembourg 3,459; United States 3,409; Netherlands 3,161.
Phosphatic	8,699	NA	NA.
Potassic	16,893	1,169	All from United States.
Other	1,473	18,351	United States 9,664; Italy 5,821; Belgium-Luxembourg 1,484.
Graphite	3	NA	
Lime	1,472	NA	
Mica, all forms	1	NA	
Salt (excluding brine)	25,431	NA	
Sodium and potassium compounds, n.e.s	318	NA	
Stone, sand and gravel	855	[2] $43,000	United States $31,000.
Sulfur	110	NA	
Other nonmetals, n.e.s	1,698	NA	
MINERAL FUELS AND RELATED MATERIALS			
Coal, all grades, including briquets	8	NA	
Coke and semicoke	137	NA	
Gas, liquefied petroleum	1,232	NA	
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	2,359	[3] 3,444	NA.
Refinery products:			
Gasoline do	224	[3] 84	NA.
Kerosine do	70	[3] 28	NA.
Distillate fuel oil do	209	[3] 213	NA.
Lubricants do	40	[3] 52	NA.
Mineral jelly and wax do	11	14	NA.
Other do	37	NA	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	5,433	NA	

NA Not available.

[1] Source: Unless otherwise specified, Statistical Office of the United Nations, Supplement to the World Trade Annual, 1970. V. 2 (South and Central America, including the Caribbean and Bermuda), Walker and Company, New York, 1972, pp. 532–542.

[2] Quantity not reported, value in U.S. dollars.

[3] Bureau of Mines, International Petroleum Annual, 1970, p. 16.

monthly. The mill can also process up to 300 tons daily of gold ore and a higher price for gold, might make it feasible to treat the "substantial reserves."

Concentrates were to be trucked to the Prinzapolca River and loaded on barges for transport to Puerto Isabel.

Mineral Fuels.—Thirty three concessions covering over 7 million hectares were held by 10 exploration companies off the Caribbean coast. Activity was confined to Western Caribbean Petroleum Co., which was preparing to conduct seismic work off the northeast coast, and Franks Petroleum Co., which was making a preliminary aerial survey in the Bluefields area in the southeast.

PANAMÁ

Decree Law 172 (Industrial Incentive Decree Law) was published in the Gaceta Oficial of August 31, 1971. The law was intended to provide conditions for greater development within Panamá. Fiscal incentives for manufacturing were desirable to encourage plants to be located in geographical balance, particularly in parts of the hinterland. The decree consisted of 41 paragraphs and applied to any Panamanian or foreign enterprise. Certain taxes and customs charges were to be exempted for the duration of the decree. Exports as well as manufacturing and processing were to be encouraged.[6]

Executive Decree No. 37 of March 15, 1971, authorized conditions which increased the import quota on nails, galvanized or ungalvanized.

Executive Decree No. 23 of February 16, 1971, authorized unlimited imports of cast iron pipes and fittings used in water and sewer installations.

Prequalification proposals for provision of a potable water supply for Panamá City were called for by Instituto de Acueductos y Alcantarillados Nacionales (IDAAN). Water was to be drawn from Madden Lake, treated, and piped to Panamá City. Total pipeline distance was 22.4 kilometers, about 14 miles.

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[6] U. S. Embassy, Panamá City, Panamá. Industrial Incentive Decree Law 172. Airgram A–204, Oct. 4, 1971, 28 pp. with enc.

Table 14.—Panamá: Apparent exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1970	Principal destinations, 1970
Aluminum metal including alloys: Scrap value, thousands	$25	NA.
Copper metal including alloys: Scrap	756	Italy 264; West Germany 192; Japan 141.
Diamond, gem, not set or strung value, thousands	$176	Switzerland $125; West Germany $27.
Lead metal including alloys: Scrap	569	Italy 234; Belgium-Luxembourg 186; West Germany 149.
Iron and steel, metal:		
Scrap	20,225	Italy 15,873; Spain 4,352.
Semimanufactures	309	All to Italy.
Platinum-group metals and silver: Waste and sweepings value, thousands	$47	All to United States.
Stone, sand and gravel, sand excluding metal bearing	9,900	All to Italy.
Petroleum:		
Crude and partly refined thousand 42-gallon barrels	[1] 387	All to United States.
Refinery products:		
Gasoline do	724	United States 496; Canada 183; Australia 45.
Kerosine do	2,053	United States 2,005; Canada 48.
Distillate fuel oils do	133	United States 48; Canada 39; Denmark 38.
Residual fuel oils do	1,027	United States 1,009; Canada 18.
Other do	358	All to Canada.

[1] Transshipped; actual country of origin not available. Converted from metric tons to barrels at the rate of 7.5 barrels per metric ton.

Source: Statistical Office of the United Nations. 1970 Supplement to the World Trade Annual. V. 2 (South and Central America, including the Caribbean and Bermuda), Walker and Company, New York, 1972, pp. 543–545.

Table 15.—Panamá: Apparent imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1970	Principal sources, 1970
METALS		
Aluminum metal including alloys, all forms	2,074	United States 1,315; Canada 389; Japan 198; Italy 67.
Copper metal including alloys, all forms	242	Canada 197; United States 45.
Iron and steel metal:		
Pig iron, ferroalloys, and similar materials	83	All from United States.
Steel, primary forms	13,931	Do.
Semimanufactures:		
Bars, rods, angles, shapes, sections	11,815	United States 4,785; Belgium-Luxembourg 2,907; Japan 1,723.
Universals, plates, and sheets	22,419	Japan 14,531; United States 4,573; Canada 1,125; Netherlands 886.
Hoop and strip	1,779	Japan 1,430; United States 196; United Kingdom 151.
Rails and accessories	127	All from United States.
Wire	3,465	Belgium-Luxembourg 1,075; West Germany 716; United States 548.
Tubes, pipes, and fittings	6,587	United States 3,502; Japan 1,824; West Germany 696.
Castings and forgings, rough value, thousands	$33	NA.
Lead metal including alloys, all forms	241	Denmark 179; United States 62.
Tin metal including alloys, all forms long tons	26	Denmark 16; United States 10.
Titanium oxides	109	All from United States.
NONMETALS		
Asbestos	368	All from Canada.
Cement	4,719	United Kingdom 2,369; Japan 2,350.
Clays and products (including all refractory bricks):		
Crude, n.e.s	672	All from United States.
Products value, thousands	$272	United States $179; Japan $66.
Fertilizer materials: Manufactured	7,254	United States 3,760; Belgium-Luxembourg 1,842; West Germany 939.
Salt	642	All from United States.
Sodium and potassium compounds, n.e.s.: Caustic soda	1,383	United States 926; United Kingdom 457.
Stone, sand and gravel: Dimension stone	4,285	All from United States.
Talc, steatite, soapstone, and pyrophyllite	401	Do.
MINERAL FUELS AND RELATED MATERIALS		
Petroleum refinery products:		
Distillate fuel oil thousand 42-gallon barrels	12	All from Yugoslavia.
Residual fuel oil do	294	United States 269; Greece 25.
Lubricants do	3	Belgium-Luxembourg 2; United Kingdom 1.
Mineral jelly and wax do	11	All from United States.
Other:		
Nonlubricating oils, n.e.s do	6	All from United States.
Bituminous mixtures, n.e.s. value, thousands	$56	Do.

Source: Statistical Office of the United Nations. 1970 Supplement to the World Trade Annual. Vol. 2 (South and Central America, including the Caribbean and Bermuda), Walker and Company, New York, 1972, pp. 546–561.

COMMODITY REVIEW

Metals.—*Copper.*—Canadian Javelin Ltd. reported that it had completed the purchase of Pavonia, S.A. In addition to acquiring the company, Javelin assumed 100-percent ownership in Pavonia's 175,000-acre concession, which includes the Cerro Colorado copper/molybdenum prospect; the prospect is situated in the Chiriqui province.

More than 75 core holes have been drilled on the Cerro Colorado property reportedly assaying up to 5 percent copper; other assays were in the range of 1 percent and less. Molybdenum, gold, and silver values have also been recorded as associated metals.

Geological and geochemical work was in progress with the object of finding surface mineralization over a wider area. A road-building program was planned for access to the deposit; extremely difficult terrain was expected to present some problems.

At midyear the Government of Panamá announced that agreement had been reached with a Japanese consortium to establish a joint venture to develop the Petaquilla and Colón copper/molybdenum resources. The Japanese group will include Mitsui Mining and Smelting Co., Nippon Mining Co., Mitsubishi Metal Mining Co., Furukawa Mining Co., Sumitomo Metal Mining Co., Dowa Mining Co., and Nittetsu Mining Co. A 60-percent interest was to be held by the Japanese interests, with the

Panamá Government holding the remainder. Geological investigation and infrastructure development was expected to take 4 years. The deposit was estimated to contain between 200 million and 300 million tons of ore averaging 0.6 percent copper metal and some molybdenum. Concentrates were to be marketed in Japan.

Field work carried on jointly by the United Nations Development Program (UNDP) and the Panamanian Government revealed copper, zinc, gold and molybdenum mineralization in a belt in the Cordillera along the San Blas coast adjacent to the Colombia border. The survey was proposed to cover some 15,000 square kilometers; the 3-year program was to cost about $1.1 million.[7]

Iron Ore.—The Pacific coast iron ore beach sand project was nearing completion; shipments of about 25,000 tons per month containing 65 percent iron and some titanium dioxide were expected to commence early in 1972. The project was held jointly by Japanese and Panamanian interests.

Mineral Fuels.—*Petroleum.*—Texaco Inc., through its affiliate Texaco Panamá Inc., purchased the two-thirds interest in Refinería Panamá S.A. which had previously been owned by Universe Tankships Inc., a subsidiary of National Bulk Carriers. The remaining one-third interest in the refinery was held by the Ultramar Group of Great Britain. The refinery, located at Las Minas Bay near Colón, is rated at 70,000 barrels of crude oil throughput daily.

The purchase gave Texaco interest in a net 500,000 barrels per day of processing capacity in 11 facilities in seven countries in the Caribbean area; this interest includes plants in Trinidad and Tobago, Venezuela, Colombia, Honduras, Guatemala, and Martinique in addition to Panamá.[8]

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[7] Mining Magazine. V. 124, No. 6, June 1971, p. 469.

[8] Wall Street Journal. V. 78, No. 44. Sept. 1, 1971, p. 17.

The Mineral Industry of Other South American Areas

By Robert A. Whitman [1] and Avery H. Reed [2]

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ECUADOR [3]

Ecuador announced its first new hydrocarbon law since 1961 with the signing by President Velasco Ibarra of Decree No. 1429 on September 27. Fundamental provisions of the new law stated that: [4]

1. Hydrocarbon deposits in whatever physical state located in the national territory, or areas covered by territorial waters, are of the inalienable and imprescriptible patrimony of the State.
2. The State shall explore and exploit the deposits indicated in Article 1 directly through the Corporación Estatal Petrólera Ecuatoriana (CEPE) which may act for itself, or by entering into contracts of association or service contracts with national or foreign entities or by forming mixed economy companies.
3. The transportation of hydrocarbons through pipelines or gaslines and their refining are rights of the State, acting through CEPE as specified in Article 2.
4. The industry of hydrocarbons is declared of public interest, which means all operations for its extraction, transformation, and transportation. Accordingly, expropriation of lands, buildings, installations, and other properties is applicable, and the creation of general or special rights of way in accordance with law, as may be ncessary for the development of this industry.
5. Hydrocarbons shall be exploited for the main purpose of industrializing them in this country.

The decree had eight more chapters containing 80 more articles which included provisions for a 12.5-percent minimum royalty, increasing to 14 percent on production of 30,000 to 60,000 barrels per day, and to 16 percent on output of more than 60,000 barrels per day. Limits on exploration concessions were reduced to about 772 square miles from the former limit of about 1,930 square miles. Maximum duration of concessions was set at 5 years for exploration and 20 years for exploitation.

CEPE was established by Decree No. 146 on January 28, 1971.

Exploration continued in the eastern jungle region. The consortium of Cia. Texaco de Petróleos del Ecuador, C.A.-Gulf Ecuatoriana de Petróleos, S.A. (Texaco-Gulf), concentrated on development wells, with three rigs drilling.

Another consortium, the World Ventures Group, comprised of eight United States firms, temporarily suspended drilling. They found oil in four of their first six wildcats.

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[1] Physical scientist, Division of Nonferrous Metals.

[2] Physical scientist, Division of Nonmetallic Minerals.

[3] Prepared by Robert A. Whitman.

[4] U.S. Embassy, Quito, Ecuador. State Department Airgram A-252, Oct. 1, 1971, pp. 1–2.

It was estimated that total potential flow of the four wells was about 1,000 barrels per day.

The consortium headed by Anglo-Ecuadorian Oilfields Ltd., and including Union Oil Co. of California, Superior Oil Co., and Standard Oil Co. of California, brought in a wildcat, 1 Tiguino, extending the Amazon basin potential about 20 miles farther south. Subsequent drilling produced three dry holes.

The Cayman Corp., operator for a group including City Investing Co. and Southern Union Production Co., had two producing wildcats in the northeastern sector before drilling a dry hole.

Participation companies announced intention to drill in two of four other concessions that were in various stages of development.

Texaco-Gulf announced late in the year that the Trans-Ecuadorian Pipeline was more than half finished. Williams Bros. was laying the pipeline under the supervision of Pemex, the Mexican State oil company. The 318-mile pipeline had about 224 miles of right-of-way cleared and graded and about 205 miles of pipe welded. The line will cross the equator twice and will cross the Andes at 13,300 feet altitude. It was expected to carry a minimum of 250,000 barrels per day to Puerto Esmeraldas on the Pacific coast.

Ada de Exploración Petrólera, S.A., completed the third gas well, 4 Amistad, in the Amistad field in the Gulf of Guayquil.

Drilling of the Chaucha porphyry copper deposit indicated 100,000,000 tons of 0.50 percent copper. The Overseas Mineral Development Corp., a Japanese Government-industry entity, was drilling under contract from the Government of Ecuador.

Table 1.—Other South American Areas: Production of mineral commodities

Area, commodity, and unit of measure	1969	1970	1971 [p]
ECUADOR [1]			
Cadmium, mine output, metal content ---- kilograms	1,028	[e] 1,040	941
Cement, hydraulic ---- thousand metric tons	456	458	462
Clays, kaolin ---- do	[r] 486	771	554
Copper, mine output, metal content ---- do	533	510	564
Gas, natural:			
Gross production ---- million cubic feet	5,849	10,176	9,620
Marketable production [e] ---- do	500	500	500
Gold, mine output, metal content ---- troy ounces	7,287	8,520	11,028
Natural gas liquids:			
Natural gasoline ---- thousand 42-gallon barrels	128	85	NA
Liquefied petroleum gases ---- do	12	48	NA
Total ---- do	140	133	NA
Petroleum:			
Crude oil ---- do	1,567	1,444	1,354
Refinery products:			
Gasoline ---- do	2,584	2,667	3,501
Jet fuel ---- do	435	612	153
Kerosine ---- do	631	490	378
Distillate fuel oil ---- do	1,527	1,842	2,009
Residual fuel oil ---- do	2,329	2,827	3,021
Lubricants ---- do	4	3	2
Other ---- do	28	60	17
Refinery fuel and losses ---- do	189	218	609
Total ---- do	7,727	8,719	9,685
Silver, mine output, metal content ---- troy ounces	82,163	69,761	72,158
Sulfur, elemental from ores ---- metric tons	4,895	6,352	[e] 6,000
Zinc, mine output, metal content ---- do	208	127	126
FRENCH GUIANA			
Clays, all types ---- metric tons	1,200	NA	NA
Gold, mine output, metal content ---- troy ounces	3,590	2,347	[e] 2,300
Sand and gravel, and stone:			
Sand ---- thousand metric tons	102	NA	NA
Gravel and crushed stone ---- do	258	NA	NA
GUYANA [1]			
Aluminum:			
Bauxite, dry equivalent, gross weight ---- thousand metric tons	4,306	[e] [r] 4,144	[e] 3,817
Alumina ---- do	303	305	305
Diamond:			
Gem [e] ---- thousand carats	21	24	19
Industrial [e] ---- do	31	37	29
Total ---- do	52	61	48
Gold, mine output, metal content ---- troy ounces	2,102	4,433	[e] 4,400

See footnotes at end of table.

Table 1.—Other South American Areas: Production of mineral commodities—Continued

Area, commodity, and unit of measure	1969	1970	1971 [p]
PARAGUAY			
Cement, hydraulic thousand metric tons	37	63	81
Clays:			
Kaolin [e] metric tons	450	600	1,200
Other [e] thousand metric tons	430	450	470
Gypsum metric tons	3,500	6,000	[e] 12,000
Lime do	19,133	21,000	23,556
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	385	482	450
Jet fuel do	44	40	48
Kerosine do	121	150	121
Distillate fuel oil do	460	395	467
Residual fuel oil do	203	216	263
Other do	41	48	2
Refinery fuel and losses do	110	108	117
Total do	1,364	1,439	1,468
Pigments, natural mineral, ocher metric tons	15	[e] 40	45
Sand including glass sand thousand metric tons	420	450	431
Stone:			
Dimension do	65	72	67
Crushed and broken:			
Limestone (for cement and lime) do	80	140	156
Other [e] do	1,420	1,500	1,520
Talc, soapstone and pyrophyllite metric tons	90	120	160
SURINAM			
Aluminum:			
Bauxite, gross weight thousand metric tons	5,450	[e] 5,340	[e] 5,590
Alumina [e] do	967	1,000	1,000
Metal, primary do	53	55	60
Clays, common [e] metric tons	3,170	3,200	3,200
Gold, mine output, metal content troy ounces	2,389	1,137	[e] 1,100
Sand and gravel:			
Sand:			
Common [e] thousand metric tons	120	120	120
Stone sand do	18	17	[e] 20
Gravel [e] do	10	10	10
Stone, crushed and broken do	[e] 80	141	[e] 140
URUGUAY			
Aluminum, secondary metric tons	400	[e] 400	[e] 400
Cement, hydraulic thousand metric tons	[r] 462	501	388
Clays, type unspecified metric tons	146,958	172,505	300,166
Coke, gashouse do	16,295	17,386	15,122
Feldspar do	1,238	1,105	1,208
Gas, manufactured million cubic feet	913	920	933
Gem stones, semiprecious:			
Agate [2] metric tons	74	79	1
Amethyst [2] do	NA	17	--
Iron and steel:			
Iron ore (for cement production) do	--	1,150	3,300
Steel, crude do	13,900	16,232	[e] 16,000
Steel semimanufactures do	[e] 35,000	41,200	46,500
Lime [e] thousand metric tons	51	61	48
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	2,333	2,252	2,156
Jet fuel do	158	176	184
Kerosine do	1,316	1,308	1,306
Distillate fuel oil do	2,315	2,610	2,681
Residual fuel oil do	4,971	5,346	5,205
Lubricants do	2	3	3
Other do	507	586	507
Refinery fuel and losses do	349	676	556
Total do	11,951	12,957	12,598
Sand and gravel:			
Sand:			
Common thousand metric tons	2,293	1,578	1,355
Glass do		17	128
Gravel do	216	[e] 220	[e] 220
Stone:			
Dimension do	67	[3] 35	23
Crushed and broken:			
Alum schist metric tons	NA	497	317
Dolomite thousand metric tons	34	41	18
Limestone do	741	909	883
Quartz metric tons	620	798	786
Other (including ballast) thousand metric tons	524	775	1,171
Sulfates, natural metric tons	58	NA	NA
Sulfur, elemental, byproducts [e] [3] do	110	120	117
Talc, soapstone and pyrophyllite (ground) do	2,306	1,634	852

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[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the commodities listed, a variety of crude construction materials (common clays, sand and gravel, and stone) undoubtedly is also produced, but output is not reported and available information is inadequate to make reliable estimates of output levels.

[2] Exports.

[3] Recovered from refinery gases.

Table 2.—Ecuador: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1970 [1]	Principal destinations, 1970
METALS		
Copper:		
Ore and concentrate	997	All to Japan.
Metal, scrap	78	All to West Germany.
Silver and platinum ores and concentrates value	$53,000	All to United States.
Zinc ore and concentrate	322	All to Japan.
Other base metals, n.e.s value	$81,000	All to United States.

[1] Source: Statistical Office of the United Nations. Supplement to the World Trade Annual, 1970. South and Central America, including Caribbean and Bermuda. V. 2, Walker and Company, New York, 1972, pp. 271–273.

Table 3.—Ecuador: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1970 [1]	Principal sources, 1970
METALS		
Aluminum metal including alloys, all forms	1,179	Austria 428; United States 371; West Germany 177.
Copper metal including alloys, all forms	367	United States 249; Canada 54; Yugoslavia 23.
Iron and steel metal:		
Steel, primary forms	17,802	United States 15,179; Belgium-Luxembourg 2,623.
Semimanufactures	116,556	Japan 56,712; France 15,531; United States 15,330.
Lead metal including alloys, all forms	415	Yugoslavia 379.
Mercury 76-pound flasks	638	All from Yugoslavia.
Tin metal including alloys, all forms long tons	19	All from United Kingdom.
Titanium oxides	115	All from United States.
Other oxides, hydroxides and peroxides of metals n.e.s	32	Do.
NONMETALS		
Asbestos	839	All from Canada.
Cement	3,741	United States 2,239; West Germany 1,502.
Clays, crude n.e.s	1,969	All from United States.
Diamond, gem, not set or strung value	$88,000	Switzerland $76,000.
Fertilizer materials, manufactured:		
Nitrogenous	10,844	Belgium-Luxembourg 9,481; West Germany 1,088.
Phosphatic	3,370	All from United States.
Potassic	6,759	Do.
Other	14,107	United States 9,417; West Germany 4,690.
Precious and semiprecious stones, except diamond value	$152,000	Switzerland $54,000; France $32,000.
Sodium compound, caustic soda	4,473	All from United States.
Other:		
Oxides and hydroxides of magnesium, strontium and barium	36	Do.
Building materials of asphalt, asbestos, and fiber cements, and unfired nonmetals, n.e.s	7,736	Spain 6,315; Italy 1,421.
MINERAL FUELS AND RELATED MATERIALS		
Petroleum:		
Crude thousand 42-gallon barrels	7,350	NA.
Refinery products:		
Gasoline do	147	
Lubricants do	87	
Other do	147	

NA Not available.

[1] Source: Statistical Office of the United Nations. Supplement to the World Trade Annual, 1970. South and Central America, including the Caribbean and Bermuda. V. 2, Walker and Company, New York, 1972, pp. 274–286.

FRENCH GUIANA [5]

Exploration of bauxite deposits in French Guiana has been approved by the French Government on concessions held by the Compagnie Minière Alcoa de Guyane (C.M.A.G.). C.M.A.G. is owned by Aluminum Co. of America (Alcoa), 75 percent, and by Péchiney of France, 25 percent. C.M.A.G. holds three concessions: Kaw, in the Kaw Mountains, about 7,400 acres; Observatoire, in the Rouri Mountains northwest of the Kaw group, about 32,100 acres; and Cayenne on Mahury Mountain just east of the capital city, about 17,000 acres. All three deposits are near the capital city of Cayenne and not far from the sea.

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[5] Prepared by Robert A. Whitman.

The French Bureau of Geological and Mineral Research estimates the three concessions contain about 25 million tons of bauxite, composed of 47 percent alumina and 2 percent silica. If C.M.A.G. finds bauxite reserves of over 100 million tons, the company has agreed to construct an alumina producing plant in French Guiana. Otherwise, some other company may build a plant or the material may be processed at Paranam, Surinam. Development of the bauxite mining operations alone is expected to cost over $16 million over a 3-year period, creating 500 jobs. After the deposit is developed, mining will provide 200 jobs, a significant boost to the local economy.

GUYANA [6]

The Government of Guyana nationalized the operations of the Demerara Bauxite Co. Ltd. (Demba), which was owned by Alcan Aluminium Ltd. (Alcan). Negotiations started in December 1970 between the Government and Alcan to give the Government 51-percent control were unsuccessful. Announcement that nationalization was to take place was made February 23, but the effective date was not until July 15, 1971. Guyana agreed to pay Alcan Aluminium Ltd. of Canada, parent company of Demba, approximately $54 million plus interest over a maximum period of 20 years. Demba workers were on strike in April for 2 weeks because of uncertainty about the vesting of their pension fund and pay raises they considered overdue.

The Guyana Bauxite Co. (Guybau) was created by the Government of Guyana to acquire the assets and operate the facilities formerly owned by Demba. Guybau appointed Gerald Metals Ltd. of London as sole sales agent for the final 6 months of 1971. Later in the year Guybau announced the signing of a 3-year contract, starting in 1972, with Philipp Brothers A. G. of Zug, Switzerland, a wholly owned subsidiary of Philipp Brothers, a division of Englehard Minerals and Chemicals Corp. in New York.

In spite of the normal problems occurring with nationalization, Guybau reportedly maintained production of calcined refratory bauxite and alumina at near 1970 levels. Production of metallurgical bauxite was less than the previous year.

Guybau increased the size of individual shipments by bulk carrier to 11,550 short tons of alumina in November and December. Vessels were designed with very shallow draft to cross the bar at the mouth of the Demarara River. Companies formerly shipped cargoes of 4,000 to 6,000 tons, which were transshipped at Trinidad. These transshipment facilities were not acquired by Guybau.

Mining of gold decreased in 1971 to one-third of the amount produced in 1970. This similarly reduced the royalties paid to the Government. The quantity of diamonds produced was about 79 percent of those produced in 1970, but the royalties were 78 percent of those paid in 1970.

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[6] Prepared by Robert A. Whitman.

Table 4.—Guyana: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum:		
Bauxite:		
Dried	1,761,473	2,339,858
Calcined	874,016	712,817
Oxide (alumina)	300,868	328,760
Copper scrap	r 96	NA
Iron and steel scrap	6,123	NA
Lead scrap	47	NA
Manganese ore and concentrate	29,282	--
Zinc metal including alloys	4	NA
Other scrap of nonferrous metals	336	NA

See footnotes at end of table.

Table 4.—Guyana: Exports and reexports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970
NONMETALS		
Cement	153	NA
Gravel and crushed rock	508	NA
Precious and semiprecious stones:		
Uncut ... value	$1,842,151	[1] $1,687,130
Cut but not set ... do	$57,027	
MINERAL FUELS AND RELATED MATERIALS		
Petroleum refinery products ... thousand 42-gallon barrels	1	NA

[r] Revised. NA Not available.

[1] Include pearls.

Table 5.—Guyana: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum metal, including alloys, all forms	[r] 393	278
Copper metal, including alloys, all forms	[r] 65	44
Iron and steel metal: Pig iron, crude steel and semimanufactures	[r] 26,166	29,611
Lead metal, including alloys, all forms	48	NA
Platinum-group metals and silver:		
Metals including alloys:		
Platinum group ... troy ounces	8	NA
Silver unworked and partly worked ... thousand troy ounces	1,055	NA
Tin metal including alloys, all forms ... long tons	21	NA
Zinc metal including alloys, all forms	24	NA
Other base metals, including alloys, all forms	12	NA
NONMETALS		
Abrasives, natural, grinding and polishing wheels and stones	18	NA
Cement	[r] 54,796	52,040
Clays and products:		
Crude n.e.s	227	NA
Products, refractory bricks	3,295	3,045
Fertilizer materials, manufactured:		
Nitrogenous	26,435	25,691
Phosphatic	2,568	3,205
Potassic	3,325	2,457
Other	1,466	NA
Lime	7,717	NA
Precious and semiprecious stones cut but not set ... value	$350	NA
Salt	[r] 3,079	3,266
Sodium and potassium compounds, n.e s.:		
Caustic soda (sodium hydroxide)	38,689	15,608
Potassium	4	NA
Stone, sand and gravel:		
Dimension stone, crude and worked	83	NA
Gravel and crushed stone	47	NA
Limestone	13,845	[1] NA
Sand	75	NA
Sulfuric acid	297	1,060
Other:		
Crude nonmetallic minerals, n.e.s	81	NA
Building materials of asphalt, asbestos, and fiber-cement, and unfired nonmetals, n.e.s	2,646	2,191
MINERAL FUELS AND RELATED MATERIALS		
Coal and coke including briquets	55	NA
Petroleum refinery products:		
Gasoline ... thousand 42-gallon barrels	380	371
Kerosine ... do	[r] 201	209
Distillate fuel oil ... do	773	705
Residual fuel oil ... do	3,814	2,286
Lubricants ... do	[r] 20	39
Asphalt and road oil ... do	[r] 28	NA
Other ... do	4	NA
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	223	NA

[r] Revised. NA Not available.

[1] Quantity not reported; value $211,073.

PARAGUAY [7]

Mineral production in Paraguay was about the same as in 1970. The total value of $20,502,000 was 1 percent above the 1970 record. The value of nonmetals decreased 2 percent, from $8,371,000 to $8,190,000, but the value of petroleum refinery products increased 3 percent, from $11,910,000 to $12,312,000. New annual records were established for the output of many commodities. Most of the commodities produced were used in construction. Other minerals, fuels, and metals required by the economy were imported. The leading mineral imports were asphalt, crude oil, salt, and iron and steel.

Work continued on plans for the Saltos-Guaira hydroelectric complex on the Parana River, to be built by Brazil, with Paraguayan approval. Loans totaling $29 million were secured for use in expanding the existing Acaray hydroelectric project on the Acaray River. A $4.8 million contract was let for a feasibility study of the proposed Yacyrita-Apipe hydroelectric project on the Parana River, to be built by Argentina, with Paraguayan approval. A loan of $24.6 million was approved to be used for starting work on the Trans Chaco highway project.

COMMODITY REVIEW

Cement shipments increased to a record 81,000 tons, 29 percent above the 1970 record. The proposed new dams will require a great expansion of cement capacity. Hitherto, most of Paraguay's cement has been produced by a 100,000-ton plant at Valle-mi.

Production of common clay for cement and heavy clay products increased to a record 470,000 tons, 4 percent above the 1970 record. Kaolin production increased 100 percent over the 1970 record.

Production of gypsum expanded to 12,000 tons, 100 percent above the 1970 record.

Output of lime was 23,600 tons, 12 percent above the 1970 record.

Output of common sand decreased to 430,000 tons, 4 percent below the 1970 record. Output of glass sand increased 5 percent.

Output of crushed and broken stone for cement and other construction and paving use increased to 1,676,000 tons, 2 percent above the 1970 record. Dimension stone production decreased 7 percent.

Total refinery output increased to a record 1,468,000 barrels, 2 percent above the 1970 record. Production of distillate fuel oil, residual fuel oil, and jet fuel set new annual records.

Crude oil for the refinery was imported from Nigeria and Algeria and was barged up the river to Asuncion. Interest continued in prospecting for oil and gas but no reserves have been discovered to date.

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[7] Prepared by Avery H. Reed.

Table 6.—Paraguay: Imports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum metal, all forms	74	81
Copper metal, all forms	187	162
Iron and steel, all forms	19,483	11,845
Lead metal, all forms	71	47
Tin metal, all forms ..... long tons	16	4
NONMETALS		
Cement, hydraulic	4,917	3,676
Salt	21,567	22,739
Crude minerals and manufactures, not further described	4,257	3,926
MINERAL FUELS AND RELATED MATERIALS		
Asphalt, natural	1,425	9,636
Coal, lignite, briquets and other solid fuel	95	55
Petroleum:		
Crude oil ..... thousand 42-gallon barrels	1,364	1,439
Refinery products:		
Gasoline ..... do	35	103
Kerosine ..... do	--	10
Distillate fuel oil ..... do	39	165
Residual fuel oil ..... do	102	13
Lubricants ..... do	34	27
Total ..... do	210	318

[1] In addition to the commodities listed individually, Paraguay reported the importation of "precious stones and metals" totaling 31.8 metric tons in 1969 and 2.9 metric tons in 1970.

SURINAM[8]

The Surinam Parliament in August ratified agreements with Reynolds Metals Co. (Reynolds) to develop bauxite deposits in the Bakhius Mountains and in the Coppename River area. This formalizes the statement of intent signed in July 1970. The Bakhius project provides for 50-50 participation between a Surinam Government corporation and Reynolds, in the exploration for and mining of bauxite, the production of alumina, and, if a power source is ultimately developed, the construction of reduction facilities. The Government will be expected to provide power, a railroad for transportation of ore to the Corantijn River, and ship-handling facilities.

The Coppename concession at present is entirely under control of Reynolds, but the Surinam Government has the option of acquiring up to 50 percent control in the future.

Bauxite exports increased 5 percent in 1971, an excellent showing considering the depressed world market. Exports of alumina increased 31 percent with the additional shipments evenly divided between the United States and Europe. Shipments of aluminum metal were 11 percent under 1970. Small increases in shipments to the United States and South American countries could not balance the pronounced decrease in shipments to Europe.

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[8] Prepared by Robert A. Whitman.

Table 7.—Surinam: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum:		
Bauxite	3,677,857	3,419,530
Oxide (alumina) and hydroxide	856,452	893,355
Metal including alloys, unwrought	53,688	53,362
Copper including alloys, unwrought	150	67
Gold troy ounces	1,201	32
Iron and steel:		
Steel, primary forms	87	44
Semimanufactures	31	66
Lead, unwrought	11	55
NONMETALS		
Sand, clays, earth	3,854	11,075
MINERAL FUELS AND RELATED MATERIALS		
Petroleum refinery products:		
Gasoline 42-gallon barrels	83	--
Lubricants do	282	84
Other do	1,801	--

Table 8.—Surinam: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum metal, including alloys	431	419
Copper metal including alloys	99	73
Gold unworked or partly worked troy ounces	10,120	3,253
Iron and steel:		
Steel, primary forms	6,203	5,922
Semimanufactures	10,758	11,225
Lead including alloys, semimanufactures	41	37
Magnesium including alloys	53	46
Tin metal long tons	9	10
Zinc metal	45	19
Other	24	3
NONMETALS		
Abrasives, natural, crude	3	5
Cement	48,161	30,326
Chalk	283	253
Clays and products:		
Crude n.e.s.[1]	63	109
Products including refractory brick and cement	2,246	2,298
Diatomite and other infusorial earths	22	25
Fertilizer:		
Nitrogenous	7,105	4,977

See footnotes at end of table.

Table 8.—Surinam: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970
NONMETALS—Continued		
Fertilizer—Continued		
Phosphatic	221	487
Potassic	51	--
Other including mixed	377	350
Lime	1,528	7,552
Salt	1,293	1,517
Stone and gravel:		
Dimension stone	90	110
Gravel and crushed rock	1,767	479
MINERAL FUELS AND RELATED MATERIALS		
Coal including briquets, all grades	26,270	30,154
Petroleum refinery products:		
Gasoline ... thousand 42-gallon barrels	197	238
Kerosine ... do	46	55
Distillate fuel oil ... do	574	739
Residual fuel oil ... do	2,331	3,072
Lubricants ... do	32	45
Liquefied petroleum gas ... do	41	54
Asphalt and bitumen, natural [2] ... do	41	16
Other ... do	1	1
Mineral tar and other coal-, petroleum-, or-gas-derived crude chemicals	86	129

[1] Includes some sand and other earth.
[2] May include some natural asphalt.

Table 9.—Bauxite, alumina, and aluminum shipments from Surinam

(Metric tons)

Company	1969	1970	1971
BAUXITE			
Suriname Aluminum Co.:			
United States and Canada	2,039,225	2,103,790	1,972,307
Western Europe	125,647	135,893	138,792
Other	12,631	18,947	10,446
Total	2,177,503	2,258,630	2,121,545
N.V. Billiton Mij.:			
United States	1,010,396	1,038,294	1,097,565
Canada	487,610	111,648	369,334
Western Europe	--	4,788	20
Other	2,348	80	3,277
Total	1,500,354	1,154,810	1,470,196
Grand total	3,677,857	3,413,440	3,591,741
ALUMINA			
Suriname Aluminum Co.:			
United States	314,732	217,253	414,512
Western Europe	194,976	220,839	293,704
Mexico	--	--	14,955
Total	509,708	438,092	723,171
N.V. Billiton Mij.:			
United States	60,442	[1] 70,156	50,811
Western Europe	146,365	325,881	369,373
Eastern Europe	144,231	59,834	25,179
Total	351,038	455,871	445,363
Grand total	860,746	893,963	1,168,534
ALUMINUM			
Suriname Aluminum Co.:			
United States	--	--	8,279
Western Europe	45,478	52,535	17,829
Far East	4,821	--	9,085
Other	3,488	828	12,480
Total	53,787	53,363	47,673

[1] United States and Canada.

URUGUAY[9]

In spite of inflation and the unsettled political climate, mineral output in Uruguay established a new annual record, 6 percent above 1970 and about the same as in 1969, the previous record year. The total value, however, declined 12 percent below the 1970 record, due to lower cement output. Expanding output of clays and stone more than offset decreased production of cement, lime, and sand and gravel.

COMMODITY REVIEW

Aluminum production was about the same as in 1971. Output of iron ore was substantially increased; interest was shown in test-drilling new deposits.

Cement production declined 23 percent and was 25 percent below the 1968 record. During the year the new Government-owned cement plant at Paysandu went onstream; annual capacity will be 120,000 tons.

Output of clays expanded 74 percent and established a new annual record. Lime shipments declined 21 percent and were 31 percent below the 1967 record. Output of sand and gravel declined 6 percent and was 32 percent below the 1969 record. Production of crushed stone expanded 25 percent and was 19 percent above the 1960 record.

Production of petroleum refinery products was about twice as much as in recent years. Plans were made for the construction of a deep-water petroleum buoy that will allow Uruguay to be served by supertankers. A geophysical survey was made to determine Uruguay's offshore petroleum possibilities, but results of the survey were not announced.

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[9] Prepared by Avery H. Reed.

The Mineral Industry of Albania, Denmark (Including Greenland), Iceland, and Switzerland

By Joseph B. Huvos,[1] F. L. Klinger,[2] David G. Willard,[3]
and Richard F. Stevens, Jr.[4]

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ALBANIA [5]

Albania's small mineral industry continued to grow at a fast rate during 1971. According to the current fifth 5-year plan of 1971–75, total industrial production should reach 11.6 billion leks[6] in 1975, an increase of 61 to 66 percent over 1970. Corresponding figures for 1971 were not available at the time of writing this chapter, but the average annual growth rate was given at 10.3 percent. The mineral extraction and processing industry had worldwide significance only for chromite ore, of which Albania produced about 8.5 percent of the world's output. However, the mineral industry remained of substantial domestic economic importance. In addition to chromite, Albania produced copper ore, blister copper and wire, nickeliferous iron ore, crude oil, natural asphalt, cement, and some lignite. Information on the performance of the mineral industry was scarce. Official Albanian sources indicated only plan fulfillment or relative increases in production. Many of the mineral industry products were exported.

In 1971, major developments in the mineral industry of Albania were as follows: Construction performed largely with the aid of the People's Republic of China, resulting in the commissioning of the Bulqizë chromite ore concentrator; construction of a copper smelter at Kukës; beginning construction of the Elbasan steel complex; and commissioning of the Korçë thermal powerplant and the first section of the Mao Tse-tung hydroelectric powerplant at Vaut Të Dejës.

PRODUCTION

Official production figures for Albania's mineral commodities were not available for 1971, but percentage increases published for previous years made it possible to compute the output. Figures for 1971 were mostly estimates based sometimes on published plan figures.

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[1] Foreign mineral specialist, Division of Fossil Fuels.

[2] Physical scientist, Division of Ferrous Metals.

[3] Economist, Division of Nonmetallic Minerals.

[4] Physical scientist (Metallurgy), Division of Ferrous Metals.

[5] Prepared by Joseph B. Huvos.

[6] Values have not been converted from Albanian currency units (leks) to U.S. dollars owing to the wide variation between the official exchange rate (lek 5.00=US$1.00) and those actually used for some transactions.

Table 1.—Other European Countries: Production of mineral commodities

Area,[1] commodity, and unit of measure	1969	1970	1971 [p]
ALBANIA [2]			
Cement, hydraulic ... thousand metric tons	328	[e] 360	[e] 360
Chromium, chromite, gross weight ... do	429	468	[e] 534
Coal, lignite ... do	640	668	[e] 700
Copper:			
Mine output, metal content [3] ... metric tons	5,222	5,588	[e] 6,350
Smelter output (blister) ... do	5,222	5,588	[e] 6,350
Iron ore, nickeliferous, gross weight ... thousand metric tons	405	540	[e] 567
Petroleum: [4]			
Crude [e] ... thousand 42-gallon barrels	8,767	9,995	12,000
Refinery products:			
Gasoline ... do	527	[e] 650	[e] 910
Distillate fuel oil ... do	992	[e] 1,200	[e] 1,690
Other (not further identified) ... do	6,007	7,450	10,410
Total ... do	7,526	[e] 9,300	[e] 13,010
DENMARK [2]			
Cement, hydraulic ... thousand metric tons	2,607	2,604	2,738
Clays, kaolin, crude and washed [3] ... metric tons	18,000	18,000	18,000
Coal, lignite ... thousand metric tons	431	135	[e] 98
Coke, gas house ... do	161	183	[e] 183
Diatomaceous materials:			
Diatomite [e] ... do	20	20	20
Moler [e] ... do	220	220	220
Fertilizer materials, manufactured:			
Nitrogenous, gross weight [5] ... do	112	94	88
Phosphatic, gross weight [5] ... do	551	526	565
Mixed and unspecified, gross weight ... do	239	250	229
Iron and steel:			
Iron ore (less than 42 percent iron), gross weight ... do	31	[e] 30	[e] 30
Pig iron and blast furnace ferroalloys ... do	[r] 208	215	228
Crude steel [6] ... do	482	473	471
Steel semimanufactures ... do	[r] 446	452	434
Lead metal, secondary (including alloys) [5] ... metric tons	11,423	10,050	10,022
Lime (quicklime and agricultural) [5] ... thousand metric tons	194	179	179
Peat fuel [e] ... do	6	6	6
Petroleum refinery products:			
Gasoline ... thousand 42-gallon barrels	11,229	11,008	12,342
Jet fuel ... do	608	584	536
Kerosine ... do	915	752	884
Distillate fuel oil ... do	19,172	21,358	24,640
Residual fuel oil ... do	26,114	31,795	31,322
Other ... do	3,707	4,775	4,876
Refinery fuel and losses ... do	4,753	5,162	3,150
Total ... do	66,498	75,434	77,750
Salt [5] ... thousand metric tons	246	436	133
ICELAND			
Aluminum smelter production, primary ... metric tons	12,400	37,958	41,000
Cement, hydraulic ... thousand metric tons	93	85	100
Diatomite ... metric tons	7,600	13,239	19,400
Fertilizer materials manufactured, nitrogenous:			
Gross weight ... do	24,350	22,621	24,230
Nitrogen content ... do	2,849	2,647	2,835
Pumice ... do	NA	11,000	24,000
Sand and gravel:			
Calcareous sand ... thousand metric tons	252	NA	NA
Calcareous sand ... thousand cubic meters	NA	144	120
Other sand and gravel ... thousand tons	3,761	4,826	4,715
Stone:			
Dimension ... thousand metric tons	18	65	52
Crushed and broken ... do	87	136	223
SWITZERLAND			
Aluminum smelter production, primary ... metric tons	77,060	91,490	94,000
Cement, hydraulic ... thousand metric tons	4,534	4,797	5,220
Coke, gashouse ... do	279	164	104
Gas, manufactured ... million cubic feet	13,121	13,981	13,637
Gypsum [e] ... thousand metric tons	100	100	100
Iron and steel:			
Pig iron and blast furnace ferroalloys ... do	25	28	32
Electric furnace ferroalloys ... do	6	9	23
Crude steel ... do	500	524	532
Steel semimanufactures ... do	515	545	550
Lime ... do	150	145	142

See footnotes at end of table.

Table 1.—Other European Countries: Production of mineral commodities—Continued

Area,[1] commodity, and unit of measure	1969	1970	1971 p
SWITZERLAND—Continued			
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	6,860	7,149	7,183
Jet fuel do	704	1,096	984
Kerosine do	39	54	39
Distillate fuel oil do	15,659	16,457	15,860
Residual fuel oil do	10,336	11,215	10,976
Other do	1,980	2,267	2,430
Refinery fuel and losses do	2,162	3,342	2,828
Total do	37,740	41,580	40,300
Salt thousand metric tons	267	333	291

e Estimate. p Preliminary r Revised. NA Not available.

[1] In addition to the areas listed, Greenland (a Territory of Denmark), covered textually in this chapter, presumably has continued to produce small quantities of crude construction materials and may have produced other minerals but output is unreported.

[2] In addition to the commodities listed, a variety of crude construction materials (common clay, sand and gravel, and stone) is undoubtedly produced, but output is unreported and available general information is inadequate to make reliable estimates of output levels.

[3] Smelter output used as an estimate of mine output inasmuch as there is no evidence of ore and/or concentrate exports.

[4] Petroleum data converted to barrels from metric tons using the following factors: crude petroleum—6.672; gasoline—8.50; distillate fuel oil 7.46; total refinery products—6.672. The other (unidentified) product figures are derived by subtracting the converted gasoline and distillate fuel oil quantities from the converted total for refinery products. Presumably, this figure excludes refinery fuel, but sources do not make this clear.

[5] Sales.

[6] Apparently excludes ship yards' production of steel castings.

TRADE

As in previous years, minerals and related products accounted for the major part of Albania's exports in 1971, of which only chromite was important at world trade levels.

Besides chromite, the main metals exported were nickeliferous iron ore, blister copper, copper cathodes, and wire, with the share of copper products increasing gradually over that of blister. Crude oil, bituminous flux, and natural bitumen were some of the other items.

Coke, iron and steel, other semimanufactured products, and phosphate rock were the main imported mineral commodities.

Among Albania's trade partners, the People's Republic of China ranks first with an estimated 65 percent of the total. Italy ranks second, and recently Yugoslavia has become the third in importance with an estimated $20 million exchange value for 1972. Among Albania's exports to Austria for 1972, nickeliferous iron ores were earmarked in the amount of 100,000 tons. Albania will export electric power worth $2 million to Yugoslavia.

For the current 1971–75 5-year plan, Albania will increase total foreign trade by 55 percent compared with the previous 5-year plan.

Table 2.—Albania: Foreign trade in selected mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1969	1970
EXPORTS		
Asphalt and bitumen, natural	19,000	NA
Cement, hydraulic [2]	6,437	NA
Chromite	409,000	NA
Copper:		
Blister	688	NA
Cathodes	1,622	NA
Wire bar	1,762	NA
Fertilizer, nitrogenous	615	NA
Nickeliferous iron ore, gross weight	398,000	NA
Silver, waste and sweepings value, thousand U.S. dollars	$123	NA
Petroleum: [3]		
Crude thousand 42-gallon barrels	567	NA
Refinery products:		
Bituminous flux do	3,291	NA
Other, unspecified do	462	618

See footnotes at end of table.

Table 2.—Albania: Foreign trade in selected mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970
IMPORTS		
Aluminum, unwrought and semimanufactures	133	373
Barite and witherite [2]	1,417	NA
Cement, hydraulic	3,000	NA
Carbon black	343	NA
Coke	24,426	NA
Copper, unwrought and semimanufactures [2]	58	NA
Fertilizer materials:		
Crude, phosphatic	[4] 52,000	NA
Other	1,000	NA
Iron and steel:		
Pig iron [2]	6,820	NA
Semimanufactures:		
Bars, rods, and sections [2]	6,900	5,100
Plates and sheets [2]	35,400	37,800
Hoop and strip [2]	600	400
Rails and accessories [2]	300	500
Pipes and tubes [2]	19,700	7,500
Wire [2]	100	--
Refractory brick	1,164	864
Petroleum products: [3]		
Gasoline [2] thousand 42-gallon barrels	188	NA
Distillate fuel oil [2] do	53	30
Other, unspecified [2] do	(5)	NA
Other crude nonmetals, n.e.s	157	NA

NA Not available.

[1] Compiled from official Albanian trade returns unless otherwise specified.

[2] Compiled from trade returns of trading partner countries reported in The Statistical Office of the United Nations. Supplement to the World Trade Annual, 1969 and 1970 eds., Walker and Company, N.Y., 1970 and 1972, and from official trade returns of Czechoslovakia and Poland.

[3] Converted from reported figures in metric tons, using the following conversion factors: crude oil—one metric ton equals 6.672 barrels; bituminous flux—one metric ton equals 6.06 barrels; other unspecified products—one metric ton equals 7.0 barrels; gasoline—one metric ton equals 8.50 barrels; distillate fuel oil—one metric ton equals 7.46 barrels.

[4] All imported from Morocco.

[5] Less than ½ unit.

COMMODITY REVIEW

Metals.—*Chromium Ore.*—During 1971, chromium ore production increased an estimated 14 percent. It was officially stated that by the end of the current 1971–75 5-year plan, chromite ore production will reach 900,000 tons.[7]

Among several chromite ore concentrating plants said to be under development in the country, the concentrating plant at Bulqizë was assumedly commissioned during the year. The plant produces a concentrate with over 50 percent metal content.[8]

Chromite is one of Albania's leading export products. Albania ranks approximately fourth among the chromite producers of the world, with about 8.5 percent of the total.

Copper.—Albanian copper ore production advanced by an estimated 14 percent. According to the current 1971–75 5-year plan, copper ore output has to reach 600,000 tons by 1975. In the same year, blister production plans are for 9,000 tons per year. It was reported that a new smelter, of unspecified capacity, was built at Kukës and that the plant was commissioned for production. Other smelters are at Rubik and Gjegjan.

Nickeliferous Iron Ore.—After chromite, nickeliferous iron ore is the second most important export mineral of Albania. According to official production plans for the current 1971–75 5-year plan, production is scheduled to reach 650,000 tons in 1975.

Iron and Steel.—By yearend, the foundation were laid at Elbasan for the construction of a major iron and steel complex to be commissioned in its first phase by 1975. According to plans, the plant is to process about 800,000 tons of nickeliferous iron ore per year. The plant will produce 250,000 tons of unspecified steel products. A 50-kilometer railroad line is also under construction to the major nickeliferous iron ore deposits near Lake Ohrid on the Yugoslav border.

A rolling mill in Elbasan was said to process imported Chinese steel.

Nonmetals.—*Cement.*—During 1971, production was unchanged with further expansion scheduled for the cement plants at

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[7] Zeri i Popullit (Country and People), (Tirana). Nov. 5, 1971.

[8] American Metal Market. V. 79, No. 31, Feb. 15, 1972, pp. 11–12.

Fushë-Krujë and Elbasan. The capacities of these plants will be raised by 100 and 200 percent, respectively. Cement production in 1972 will increase by 9 percent over 1970. By the end of the current 1971–75 5-year plan, cement production in 1975 has to increase by 190 percent, compared with 1970 figures, bringing production slightly over 1 million tons per year. This is part of the expansion of the building materials industry which will grow 100 percent during the plan period, including several additional brick plants which will lead to an increase in brick production of 50 percent. In 1972, brick production will grow by 17 percent, with five new brick plants, one each at Shkodër, Tirana, Durrës, Elbasan, and Korçë. Plants will be under construction at Vlorë, Fier, and Peshkopi.

Fertilizer Materials.—Fertilizer production was practically unchanged. Nitrogenous fertilizer production apparently satisfied domestic demand and 1969 exports were reported in 1970. There was no news on the state of the planned Laç nitrogeneous fertilizer plant, but the plant should be onstream by 1975, for which year a 132 percent increase is scheduled in nitrogen fertilizer production.

Phosphatic fertilizer output was based mostly on Moroccan phosphate rock which was imported at a rate of 22,000 tons during the first quarter of 1971. Phosphate rock consumption was 60,000 tons in 1970. Fertilizer produced and consumed totaled 20,000 tons of P_2O_5 equivalent.[9] By 1975, an increase of 40 percent is planned for phosphatic fertilizer compared with the 1970 figure.

The Laç superphosphate plant was in the news for exceeding unspecified production plans during 1971.

Albanian potash fertilizer consumption, all from imports, was equivalent to 2,000 metric tons of potassium oxide.

Sulfuric Acid.—According to plans, an increase of 77 percent is scheduled for sulfuric acid production in 1975, compared with 1970 figures.

Mineral Fuels.—The production of fuels continued to increase during 1971. The previous increase was 81 percent in 1970 compared with 1965. Coal extraction increased 83 percent for the same period, and electric power increased 2.8 times.

By yearend, the Korçë thermal plant, of unspecified capacity, was commissioned. The Mao Tse-tung hydroelectric powerplant was also commissioned when the first two turbines of unspecified capacity went onstream at Vaut Të Dejës. The Fierza hydroelectric powerplant, to be built during the sixth 5-year plan, will have a capacity of 400 megawatts.

Coal.—Lignite production continued to increase during the year, and according to the current 1971–75 5-year plan, output should reach 1.25 million tons by 1975. New mines will be opened at Valas in the Tirana District making it possible to reach increased plan figures.

Petroleum.—Production of crude oil continued to increase in 1971 and, according to the current modified 1971–75 5-year plan, it will reach 2.7 million metric tons in 1975. For 1972, an increase of 15 percent is planned. To facilitate prospecting, a map was prepared showing useful minerals at a scale of 1:1,200,000, while a 1:1,500,000 tectonic map was prepared in 1971.

It was reported that, during the year, the first domestically produced drilling rig was put into use.

According to the latest available information, Albanian crude reserves in 1969 stood at 14 million metric tons.[10]

Work continued on the construction of the Fier petroleum refinery, due to have a capacity of 1.5 million tons. It was also reported that the Patras oil refinery exceeded unspecified production plans.

DENMARK (INCLUDING GREENLAND)[11]

A modest growth in production and trade appeared to take place in Denmark's mineral industry in 1971. Increased output of construction materials, chemical fertilizer, and petroleum products was partly offset by a decline in the production and consumption of metals.

Significant new developments in 1971 included preparations to begin production of crude oil in 1972 from the Danish sector of the North Sea, and exploration of lead-zinc deposits near Marmorilik, Greenland, which was proving the existence of additional reserves of high-grade ore. Also in Greenland, two companies agreed to jointly evaluate the commercial potential of iron deposits near Isua.

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[9] British Sulphur. Statistical Supplement (London). No. 4, November–December 1971, p. 8.

[10] World Oil. V. 173, No. 5, October 1971, p. 119.

[11] Prepared by F. L. Klinger.

PRODUCTION

Volume indices of production for the principal sectors of the Danish minerals industry in 1970 and 1971[12] were estimated as follows:

Industry sector	(1968 = 100)	
	January 1970 r	June 1971
Extractive	98	105
Primary metals	114	115
Nonmetallic mineral processing	109	122
Chemicals	123	121
Petroleum and coal processing	97	122
All industry	111	115

r Revised.

Source: Statistiske Efterretninger. V. 64, No. 25, April 14, 1972, pp. 412–414.

Production of steel and nonferrous metals appeared to decline in 1971.[13] There was a general decline in imports and domestic consumption, although exports of nonferrous metals increased. Total output of nonmetallic commodities increased, since relatively large gains were recorded in sales and/or exports of high-volume commodities such as gravel, crushed stone, cement, and manufactured fertilizers. Production of clays, chalk, building stone, and diatomaceous materials appeared to be less. There was a substantial increase in output of petroleum products.

Production of mineral commodities is shown in table 1.

TRADE

The value of Denmark's trade in mineral commodities increased in 1971 despite a considerable reduction in the quantity of imports. Compared with 1970, the value of exports increased about 0.5 percent to approximately $300 million, while the value of imports rose about 3 percent to nearly $1,200 million. The apparent deficit attributable to mineral commodities was equivalent to about 90 percent of the apparent deficit generated by all Danish trade.

Fuels continued to be the most significant items, accounting for 29 percent of the value of mineral commodity exports and 47 percent of the value of mineral commodity imports in 1971. Metals, particularly iron and steel, ranked next in importance, followed by nonmetallic mineral manufactures and inorganic chemicals.

Trade in mineral commodities in 1969 and 1970 is detailed in tables 3 and 4.

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[12] Average indices for the first 6 months of each year. Figures for 12 months of 1971 were not available.

[13] Data on production of individual mineral commodities is not reported in Danish official statistics. Instead, data are published on the quantity and value of sales. This data, used in conjunction with data on exports, imports, and stocks, may be used as a rough guide to production but the margin of error is unknown.

Table 3.—Denmark: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum:			
Oxide and hydroxide [1]	113	87	United Kingdom 55; West Germany 18; Norway 3.
Metal including alloys:			
Unwrought, including scrap	3,091	3,406	Sweden 1,471; Belgium-Luxembourg 725; West Germany 432.
Semimanufactures	3,696	4,490	Sweden 1,447; United Kingdom 621; West Germany 568.
Antimony metal including alloys	103	54	Brazil 28; Sweden 20; Trinidad 6.
Copper:			
Matte	44	3	All to Norway.
Metal including alloys:			
Scrap	3,480	5,437	West Germany 2,788; Belgium-Luxembourg 1,820; Sweden 648.
Unwrought	811	1,837	West Germany 1,205; Sweden 442; Italy 165.
Semimanufactures	2,449	2,230	Sweden 702; United Kingdom 603; West Germany 205.

See footnotes at end of table.

Table 3.—Denmark: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS—Continued			
Iron and steel:			
Ore and concentrate	24,273	20,904	West Germany 14,540; Belgium-Luxembourg 2,094; United Kingdom 2,000.
Roasted pyrite	119,493	111,401	West Germany 111,400; Iceland 1.
Metal:			
Scrap	23,575	24,313	West Germany 11,701; Norway 5,921; Sweden 4 972.
Pig iron including cast iron	655	1,632	Sweden 1,608; West Germany 14; Iceland 5.
Sponge iron powder and shot	231	242	West Germany 233; Sweden 7.
Spiegeleisen	9	(2)	NA.
Ferroalloys	537	--	
Steel primary forms	3,415	3,104	Norway 2,116; West Germany 812; Sweden 89.
Semimanufactures:			
Bars, rods, angles, shapes, and sections	98,562	105,630	West Germany 57,373; United Kingdom Kingdom 15,696; Sweden 13,373.
Universals, plates, and sheets	105,961	133,831	Sweden 46,195; Norway 37,791; West Germany 36,388.
Hoop and strip	1,425	1,195	Sweden 526; Norway 398; West Germany 186.
Rails and accessories	25,083	7,793	Italy 4,294; West Germany 2,621; France 863.
Wire	2,939	1,930	Sweden 1,503; Finland 241; Norway 168.
Tubes, pipes and fittings	12,712	12,160	Sweden 6,905; Poland 819; Iceland 619.
Castings and forgings, rough	4,890	6,976	Sweden 4,075; West Germany 1,231; Norway 528.
Total semimanufactures	251,572	269,515	
Lead, metal including alloys:			
Scrap	57	15	Venezuela 14.
Unwrought	4,538	3,793	Norway 1,200; Hungary 444; Switzerland 396.
Semimanufactures	116	121	Iceland 48; Norway 43; West Germany 22.
Magnesium metal, including alloys, all forms	102	61	Norway 38; West Germany 9; Sweden 7.
Manganese oxides	--	(2)	NA.
Nickel, metal including alloys, all forms	359	250	Netherlands 97; West Germany 67; Sweden 51.
Silver:			
Waste and sweepings thousand troy ounces	1,148	952	Sweden 267; West Germany 231; United Kingdom 219.
Metal including alloys, all forms do	698	167	West Germany 129; Finland 23.
Tin metal including alloys:			
Scrap long tons	47	3	All to West Germany.
Unwrought do	1,464	1,333	Hungary 559; Norway 126; Venezuela 102.
Semimanufactures do	51	57	Sweden 46; Switzerland 3; Iran 2.
Titanium dioxide	34	123	Indonesia 51; United States 36; Ethiopia 25.
Zinc:			
Oxide	16	19	Iceland 13; Sweden 4; Netherlands 2.
Metal, including alloys:			
Scrap including blue powder (dust)	3,312	2,907	Norway 1,025; West Germany 966; Belgium-Luxembourg 301.
Unwrought and semimanufactures	235	415	Greece 71; Netherlands 64; West Germany 58.
Other:			
Ash and residue containing nonferrous metals	5,383	6,541	West Germany 3,643; Netherlands 1,479; Sweden 1,179.
Oxides, hydroxides, and peroxides of metals n.e.s	198	18	West Germany 6; Italy 3; Kenya 3.
Base metals, including alloys, all forms, n.e.s	[r] 163	3	Norway 1; United Kingdom 1.
NONMETALS			
Cement	155,811	158,820	Ireland 40,933; Sweden 22,555; United Kingdom 21,926; Israel 16,334.
Chalk	20,948	22,019	Sweden 8,128; West Germany 5,963; Norway 3,504; Finland 2,390.
Clays and products (including all refractory brick):			
Crude n.e.s	3,506	6,040	Finland 3,911; Sweden 1,239; Norway 150.

See footnotes at end of table.

Table 3.—Denmark: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
NONMETALS—Continued			
Clays and products (including all refractory brick)—Continued			
Products:			
Refractory [3]	43,242	50,212	West Germany 8,941; United Kingdom 8,472; Netherlands 5,986.
Nonrefractory	91,468	93,418	West Germany 66,813; Norway 18,366; Sweden 5,425.
Cryolite	45,400	33,173	NA.
Diamond:			
Gem, not set or strung value, thousands	$44	$50	Hong Kong $28; Belgium-Luxembourg $13; West Germany $4.
Diatomite and other infusorial earths	92,935	100,348	West Germany 59,552; United Kingdom 25,697; Sweden 4,896.
Feldspar and fluorspar	117	35	France 20; Australia 15.
Fertilizer materials:			
Crude:			
Phosphatic	67	961	Sweden 960.
Other	195	474	Sweden 464; West Germany 9.
Manufactured:			
Nitrogenous	5,210	30	Iceland 26; Sweden 3.
Phosphatic	59,129	34,525	East Germany 34,477; Guatemala 40.
Potassic	1	5	Italy 2; West Germany 2.
Other including mixed	684	416	Sweden 340; United States 29; United Kingdom 17.
Ammonia	16,544	6,623	Norway 2,675; Sweden 2,640; United Kingdom 1,300.
Lime	18,712	22,993	Norway 17,429; Sweden 4,288; West Germany 700.
Pigments, mineral including processed iron oxide	131	137	Finland 58; West Germany 51; Norway 7.
Salt	3,173	5,959	Sweden 3,911; Norway 1,705; Iceland 278.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	56,538	91,577	West Germany 90,874; Sweden 701.
Worked	1,063	570	Sweden 199; West Germany 187; Norway 106.
Dolomite, chiefly refractory grade	8	36	Iceland 15; Iran 10; Kuwait 10.
Gravel and crushed rock thousand tons	2,118	2,834	West Germany 2,800; Sweden 19; Netherlands 4.
Limestone (except dimension)	110,538	116,229	Sweden 63,482; West Germany 33,526; Norway 13,410.
Quartz and quartzite	69	8	Iceland 6; Belgium-Luxembourg 1.
Sand excluding metal bearing	131,799	135,790	Sweden 113,207; West Germany 12,763; Norway 6,858.
Sulfuric acid	7,621	7,540	United Kingdom 5,989; West Germany 1,480; Iceland 41.
Talc, steatite, soapstone and pyrophyllite	236	142	Sweden 80; Iceland 17; Indonesia 11; Iran 11.
Other nonmetals, n.e.s.:			
Crude	r 3,219	1,674	West Germany 1,495; Finland 151; United Kingdom 13.
Slag, dross and similar waste not metal bearing	48,583	44,558	All to West Germany.
Oxides and hydroxides of magnesium, strontium and barium	4	9	Sweden 5; United Kingdom 3; Finland 1.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen natural	83	77	Norway 31; Sweden 25; Turkey 7.
Carbon black and gas carbon	269	308	Sweden 182; Norway 82; Finland 26; Turkey 10.
Coal and coke including briquets	88,134	85,875	Sweden 51,749; Norway 21,929; West Germany 10,080.
Peat including peat briquets and litter	4,430	4,800	West Germany 2,581; Arab Republic of Egypt 1,601; Japan 242.
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	2,788	4,397	Sweden 3,312; United Kingdom 450; Norway 433.
Kerosine and jet fuel do	128	255	Sweden 157; Norway 63; West Germany 29.
Distillate fuel oil do	2,610	3,025	Sweden 2,592; Norway 433.
Residual fuel oil do	4,309	5,029	Sweden 4,229; Norway 536; United Kingdom 142.
Lubricants do	139	146	Norway 98; Sweden 18; West Germany 6.
Other do	385	380	Norway 207; Finland 146; Sweden 15.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	2,520	653	Norway 259; Sweden 233; Iceland 73.

r Revised. NA Not available.

[1] Including synthetic corundum.

[2] Less than ½ unit.

[3] Including those of magnesite, diatomite, and other refractory materials.

Table 4.—Denmark: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum:			
Oxide and hydroxide [1]	618	681	United States 386; France 150; West Germany 89.
Metal including alloys:			
Scrap	1,572	1,449	U.S.S.R. 758; Iceland 153; Sweden 139; Norway 122.
Unwrought	13,897	10,605	Norway 7,785; Canada 1,294; United Kingdom 1,145.
Semimanufactures	23,829	26,204	Sweden 6,232; West Germany 4,153; Norway 3,298.
Antimony metal, including alloys, all forms	109	22	United Kingdom 7; Japan 5; People's Republic of China 5; Sweden 5.
Cadmium oxide and hydroxide	23	15	Sweden 7; United Kingdom 3; West Germany 3.
Chromium oxide and hydroxide	423	907	U.S.S.R. 362; West Germany 283; France 199.
Cobalt metal including alloys, all forms	32	17	Belgium-Luxembourg 10; United Kingdom 3; West Germany 3.
Copper metal including alloys:			
Scrap	236	886	Sweden 418; Colombia 210; Iceland 190.
Unwrought	3,934	4,680	Belgium-Luxembourg 3,940; West Germany 445; Sweden 96.
Semimanufactures	28,984	31,707	Sweden 12,290; United Kingdom 5,603; Belgium-Luxembourg 3,800.
Iron and steel:			
Ore and concentrates	1,596	3,230	All from Sweden.
Roasted pyrite	14,067	3,951	Norway 3,946; Netherlands 5.
Metal:			
Scrap	41,982	29,090	East Germany 17,284; Poland 6,905; West Germany 4,670.
Pig iron, including cast iron [2]	25,454	30,489	West Germany 16,300; Norway 5,862; U.S.S.R. 5,696.
Ferroalloys	15,390	18,053	Norway 14,884; U.S.S.R. 1,184; Sweden 1,032.
Steel, primary forms	155,656	176,461	Norway 58,009; Sweden 53,674; West Germany 40,449.
Semimanufactures:			
Bars, rods, angles, shapes and sections [3]	r 433,492	420,406	West Germany 128,463; Belgium-Luxembourg 90,395; Sweden 55,474.
Universals, plates and sheets	655,133	618,239	West Germany 157,269; Sweden 101,064; Belgium-Luxembourg 82,923.
Hoop and strip	81,615	93,106	Belgium-Luxembourg 32,618; West Germany 31,595; Sweden 8,401.
Rails and accessories	20,276	19,800	France 13,224; West Germany 3,232; Belgium-Luxembourg 1,270.
Wire	r 8,123	7,249	West Germany 2,913; United Kingdom 1,755; Sweden 1,610.
Tubes, pipes, and fittings	164,947	174,789	West Germany 59,431; United Kingdom 31,736; France 15,242.
Castings	1,877	2,293	United Kingdom 1,393; Netherlands 651; West Germany 240.
Total semimanufactures	r 1,365,463	1,335,882	
Lead:			
Oxides	1,203	1,058	West Germany 412; Mexico 245; East Germany 145.
Metal, including alloys:			
Scrap	9,799	7,547	Norway 2,834; Surinam 1,049; Kenya 835.
Unwrought	10,828	11,345	Sweden 4,471; Territory of South-West Africa 3,511; United Kingdom 791.
Semimanufactures	686	874	West Germany 725; United Kingdom 106.
Magnesium metal including alloys, all forms	174	159	Norway 136; Sweden 10; Italy 6.
Manganese:			
Ore and concentrate	9,106	11,562	Netherlands 5,046; Brazil 3,709; People's Republic of China 2,000.
Oxides	1,544	1,872	Japan 811; Netherlands 609; Belgium-Luxembourg 280.
Mercury ... 76-pound flasks	580	592	Spain 215; Yugoslavia 212; Sweden 61.
Molybdenum metal including alloys, all forms	15	6	Austria 4; West Germany 2.

See footnotes at end of table.

Table 4.—Denmark: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS—Continued			
Nickel:			
Ore and matte	16	9	United Kingdom 8; Canada 1.
Metal including alloys:			
Unwrought including scrap	73	96	United Kingdom 78; Canada 15; Belgium-Luxembourg 3.
Semimanufactures	774	592	United Kingdom 152; Sweden 109; West Germany 83.
Platinum-group metals and silver including alloys, all forms:			
Platinum group thousand troy ounces	12	17	West Germany 6; Switzerland 5; Netherlands 3.
Silver do	3,469	3,585	West Germany 1,392; United Kingdom 1,276; Switzerland 489.
Tin metal including alloys:			
Scrap long tons	[r] 282	750	Belgium-Luxembourg 216; West Germany 135; Italy 93; Switzerland 75.
Unwrought do	[r] 1,146	1,225	People's Republic of China 585; West Germany 127; Netherlands 119.
Semimanufactures do	[r] 86	89	United Kingdom 68; West Germany 15.
Titanium oxides	6,925	7,972	Norway 1,870; Netherlands 1,794; United Kingdom 1,757.
Tungsten metal including alloys, all forms	5	16	West Germany 10; Sweden 5.
Zinc:			
Oxide	2,034	2,582	West Germany 1,664; Netherlands 382; East Germany 298.
Metal including alloys:			
Blue powder including scrap	675	772	Norway 386; United Kingdom 228; Belgium-Luxembourg 31.
Unwrought	13,297	15,264	Norway 4,285; Netherlands 2,483; Finland 2,032.
Semimanufactures	6,863	6,470	Yugoslavia 2,872; Poland 1,805; Belgium-Luxembourg 1,097.
Other:			
Ore and concentrate of base metals, n.e.s	595	1,024	Australia 766; West Germany 98; Netherlands 83.
Ash and residue containing nonferrous metals	1,334	2,340	Hungary 1,030; Sweden 750; West Germany 550.
Metals including alloys, all forms:			
Metalloids	1,810	2,103	West Germany 1,346; Norway 371; Sweden 339.
Alkali, alkaline earth and rare-earth metals	364	329	West Germany 328.
Pyrophoric alloys	7	5	United States 3; Austria 1; West Germany 1.
Base metals including alloys, all forms, n.e.s	193	79	Belgium-Luxembourg 17; Norway 13; Sweden 13; United Kingdom 13.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	8,157	6,717	West Germany 5,728; Netherlands 431; Italy 398.
Dust and powder of precious and semiprecious stones	109	14	West Germany 9; Belgium-Luxembourg 3.
Grinding and polishing wheels and stones	1,092	1,250	Sweden 378; West Germany 278; Austria 232.
Asbestos	24,929	28,690	Canada 15,694; Cyprus 6,003; Republic of South Africa 3,505.
Barite and witherite	1,125	847	West Germany 806; People's Republic of China 40.
Boron:			
Crude natural borates	2,253	2,077	United States 1,316; Turkey 553; Netherlands 135.
Oxides and acids	129	216	United States 81; Turkey 60; Belgium-Luxembourg 36; France 36.
Cement	25,967	4,375	United Kingdom 2,560; West Germany 711; Finland 612.
Chalk	4,672	4,924	West Germany 3,372; France 952; Switzerland 429.
Clays and products (including all refractory brick):			
Crude, kaolin and other clays	73,078	80,917	United Kingdom 50,842; Czechoslovakia 10,281; West Germany 8,672.

See footnotes at end of table.

Table 4.—Denmark: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
NONMETALS—Continued			
Clays and products (including all refractory brick)—Continued			
Products:			
Refractory (including nonclay bricks)	35,989	31,770	West Germany 9,896; Austria 9,165; Sweden 8,347.
Nonrefractory	72,292	61,988	West Germany 22,458; Japan 9,814; Sweden 9,574.
Diamond:			
Gem, not set or strung thousand carats	20	5	United Kingdom 3; Belgium-Luxembourg 2.
Industrial do	35	40	United Kingdom 30; West Germany 10.
Diatomite and other infusorial earths	4,572	4,354	United States 2,708; Iceland 660; West Germany 514.
Feldspar, leucite and nepheline syenite	8,437	10,953	Norway 10,096; Sweden 701; Finland 130.
Fertilizer materials:			
Crude:			
Nitrogenous	21,063	13,269	All from Chile.
Phosphatic	329,793	318,665	Morocco 204,844; U.S.S.R. 86,171; Tunisia 24,385.
Potassic	1,232	1,080	All from West Germany.
Manufactured:			
Nitrogenous	213,276	204,812	Norway 175,821; West Germany 26,933; Romania 756.
Phosphatic:			
Thomas (basic) slag	835	580	All from West Germany.
Other	38,584	24,875	Netherlands 10,417; Belgium-Luxembourg 4,755; United States 3,496.
Potassic	233,561	229,006	West Germany 150,541; East Germany 55,023; U.S.S.R. 13,109.
Other including mixed	329,165	396,360	Norway 315,680; West Germany 63,635; Belgium-Luxembourg 14,385.
Ammonia	203,456	172,111	United States 79,230; Norway 37,448; Trinidad 28,647.
Fluorspar	1,728	3,781	Republic of South Africa 2,229; East Germany 1,312; Sweden 239.
Graphite, natural	401	233	West Germany 117; Norway 64; United Kingdom 28.
Gypsum and plaster	174,526	242,415	Poland 143,503; France 85,175; West Germany 10,922.
Lime	2,324	3,945	West Germany 3,087; Poland 529; United Kingdom 246.
Magnesite	6,376	8,572	Austria 3,676; Spain 1,030; Czechoslovakia 1,020.
Mica:			
Crude including splittings and waste	352	429	United Kingdom 177; Norway 168; Republic of South Africa 55.
Worked including agglomerated splittings	221	117	West Germany 72; Sweden 25; France 8.
Pigments, mineral:			
Natural, crude	318	364	Cyprus 147; West Germany 131; United Kingdom 54.
Iron oxides, processed	3,867	3,683	West Germany 3,009; Spain 378; United Kingdom 180.
Precious and semiprecious stones, except diamond kilograms	1,883	5,436	West Germany 2,991; United States 1,795; India 281.
Pyrite	146,774	165,395	Spain 114,779; Portugal 46,541; Belgium-Luxembourg 4,075.
Salt	249,590	454,206	West Germany 307,997; U.S.S.R. 86,399; East Germany 16,784.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous (including marble)	8,056	8,808	Sweden 4,058; Norway 2,307; Italy 2,130.
Slate	12,050	16,881	Norway 10,166; Sweden 4,201; West Germany 1,324.
Other (granite, gneiss, etc.)	40,560	115,529	Sweden 114,798; Portugal 363; Norway 297.
Worked, all types	48,090	51,274	Portugal 30,814; Sweden 8,487; West Germany 8,466.
Dolomite, chiefly refractory grade	21,935	32,255	Norway 24,713; West Germany 3,541; Sweden 1,996.

See footnotes at end of table.

Table 4.—Denmark: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
NONMETALS—Continued			
Stone, sand and gravel—Continued			
Gravel and crushed rock	473,009	469,476	Sweden 369,343; Norway 89,769; West Germany 7,488.
Limestone (except dimension)	58,512	70,428	Sweden 63,233; Poland 6,198; Norway 536.
Quartz and quartzite	5,282	6,701	Sweden 3,434; Norway 2,341; West Germany 420.
Sand excluding metal bearing	91,796	131,373	Belgium-Luxembourg 108,843; Sweden 11,713; West Germany 5,891.
Sulfur:			
Elemental, all forms	11,632	11,142	Poland 3,882; France 2,750; Finland 2,415; United States 980.
Sulfur dioxide and sulfuric acid	3,965	4,071	West Germany 3,271; East Germany 557; Netherlands 116.
Talc, steatite, soapstone, and pyrophyllite	13,393	17,828	Norway 8,122; Sweden 4,635; West Germany 3,133.
Other nonmetals, n.e.s.:			
Crude	35,058	35,071	West Germany 28,671; Sweden 4,846; United States 862.
Slag, dross and similar waste, not metal bearing	48,222	22,438	Sweden 9,632; United Kingdom 9,353; West Germany 2,968.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	1,706	1,710	United States 1,337; West Germany 172; United Kingdom 151.
Carbon black	3,356	3,847	West Germany 1,189; United Kingdom 1,176; United States 773.
Coal and coke including briquets thousand tons	4,242	3,616	Poland 2,782; U.S.S.R. 703; West Germany 97; East Germany 72.
Gas, hydrocarbon, liquefied do	91	109	West Germany 61; Sweden 21; Netherlands 8.
Peat, including peat briquets and litter	9,136	13,209	Sweden 12,407; West Germany 366; Finland 287.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	62,359	74,475	Kuwait 20,393; Saudi Arabia 12,118; Oman 10,094.
Refinery products:			
Gasoline do	6,882	7,631	United Kingdom 2,592; Netherlands 1,402; Sweden 1,108.
Kerosine and jet fuel do	[r] 4,823	4,789	Netherlands 1,726; United Kingdom 1,253.
Distillate fuel oil do	24,445	29,300	United Kingdom 15,602; Netherlands 2,655; Sweden 2,082.
Residual fuel oil do	23,765	32,019	United Kingdom 14,427; Netherlands 3,961; U.S.S.R. 3,459.
Lubricants do	608	708	United Kingdom 344; Netherlands 150; Sweden 87.
Mineral jelly and wax do	102	108	West Germany 82; Indonesia 6; U.S.S.R. 5.
Other do	[r] 1,816	1,968	Netherlands Antilles 817; West Germany 648; Sweden 265.
Total do	[r] 62,441	76,523	

[r] Revised.

[1] Not including synthetic corundum.

[2] Including spiegeleisen, grit, sponge, and powder of iron and steel.

[3] Including wire rod.

COMMODITY REVIEW

Metals.—*Iron Ore.*—In 1971, the Marcona Corp. signed an equal-partnership agreement with the Øresund Cryolite Co. to evaluate the commercial potential of iron deposits near Isua, Greenland. The deposits are located about 100 miles north of Godthaab and 100 miles south of the Arctic Circle, and reportedly contain at least 500 million tons of material assaying about 39 percent iron.

Iron and Steel.—Det Danske Staalvalsevaerk (DDS) continued to account for most of the crude and finished steel produced in Denmark. DDS reported crude steel output totaling 436,000 tons in 1971; company output of salable steel included 212,000 tons of flat products (apparently including slabs, as primary forms) and

241,000 tons of other semimanufactures. Most of the crude steel was produced from scrap. Part of the company's output of rolled products was based on steel slabs imported from the Norwegian State steelworks, which has limited rolling facilities.

According to DDS, Danish consumption of rolled steel declined to approximately 780,000 tons in 1971, compared with 840,000 tons in 1970 and 905,000 tons in 1969. Government statistics indicated that net imports of iron and steel semimanufactures declined to about 1.1 million tons in 1971, about 10 percent less than in 1970. In terms of value, the decline amounted to 20 percent.

As of December 31, 1971, Danish stocks of iron and steel scrap totaled 376,000 tons, compared with 255,000 tons the preceding year. During the same period, stocks of pig iron and semimanufactures of iron and steel declined about 5 percent to 525,000 tons.

Lead and Zinc.—An extensive underground exploration program was begun in 1971 on deposits of lead-zinc-silver ore at Marmorilik, Greenland, by Greenex A/S, a subsidiary of Cominco Ltd. of Canada. A double-track cable car system, 1,500 meters long, was built across Marmorilik Fiord to a station inside the mountain at 600 meters above sea level. Approximately 2,000 feet of tunneling and 12 diamond-drill holes were completed during 1971. The results of this work were confirming ore grades of better than 20 percent combined lead and zinc, which had been indicated by drilling in 1966–67, and also indicated that ore reserves were substantially greater than the previously reported figure of 2.5 million tons. The exploration program was scheduled to be completed by mid-1972.

Under the agreement between Greenex A/S and the Danish Government, the company is reportedly required to expend $300,000 per year until a decision is made regarding production. This decision must be made by September 30, 1975. During the initial 25 years of the concession (following a decision to start production), the company is subject to a fixed royalty of 45 percent on income from mining but no royalty is payable until preproduction expenses have been recovered. The company will be exempt from taxes on earnings from mining, and from customs and other import charges. An annual rental of $45,000 becomes payable after the decision to start production. The concession (about 37,000 acres) excludes oil, gas, and related hydrocarbons, and radioactive materials.

Uranium.—The Danish Atomic Energy Commission and the Geological Survey of Greenland continued to evaluate uranium resources in the Kvanefjeld area of south Greenland. Gamma-spectrometers were used to evalute about 13,000 feet of radioactive drill core and to map uranium distribution in the area. The quantity of uranium-bearing materials was not announced, but the grade was acknowledged to be low.

Only part of the uranium was reported to occur in well-defined minerals, with much of it distributed in so-called pigmentary materials associated with phosphorus- and lanthanide-bearing silicates. For this reason, concentration of the ore by flotation or magnetic separation was said to be unsatisfactory. A method of recovering the uranium by sulfatizing roasting, followed by solvent extraction, was being tested but appeared to permit recovery of only about 50 percent of the uranium.

Nonmetals.—*Cement and Other Construction Materials.*—Activity in the construction industry in 1971 appeared greater than that of 1970 but did not reach the level of 1969. The number of buildings started and under construction was 2 to 5 percent greater than in 1970, although new investment in building construction was estimated to be 10 percent less.

Domestic sales and exports of cement, gravel, and crushed stone were well above the levels of 1970. The quantity of crude moler and other diatomaceous materials sold increased about 20 percent, but exports were 35 percent less. Total sales and exports of refractory (moler) brick totaled 95,000 tons and 45,000 tons, respectively, about the same as in 1970. Imports of asbestos, clays, gypsum, and sand declined in 1971, but imports of gravel and building stone were sharply increased.

Cryolite.—Cryolite from Greenland continued to be the most valuable nonmetallic mineral commodity exported by Denmark. Exports in 1971 totaled 27,936 tons valued at approximately $9 million.

Fertilizer Materials.—Production of manufactured fertilizer by Superfos A/S (formerly, Dansk Svovlsyre og Superphosphat Fabrik) rose to 850,000 tons in 1971, an increase of 120,000 tons compared with production in 1970. Most of the increase in production was registered in phosphorus-potassium (PK) fertilizer and came from a new 300,000-ton-per-year plant in Norresundby. The production of chlorine-free compound fertilizer from potassium chloride was begun at Fredericia in 1971, using a process developed and patented by the company. Imports of crude phosphate declined slightly to 313,000 tons in 1971, while imports of manufactured fertilizers were reduced to 808,000 tons.

Danish consumption of nitrogen in the 1970–71 agricultural year increased about 5 percent to 284,000 tons. Consumption of potassium (150,000 tons) and phosphorus (about 55,000 tons) was relatively unchanged.

Mineral Fuels.—*Coal and Coke.*—Imports of coal in 1971 totaled 2.26 million tons, 30 percent less than in 1970. Owing to higher prices for coal, however, the total value of imports remained at about $27 million. Imports of coke declined by 60 percent, to 140,000 tons, and imports of brown coal and peat were also reduced. The decline in imports of coal was partly due to reduced demand from Danish powerplants supplying electricity to Sweden. Danish stocks of coal increased by 166,000 tons during 1971, to 1,944,000 tons at yearend. Stocks of coke declined by nearly 50 percent to 68,000 tons.

Petroleum.—*Exploration and Development.*—The first permanent drilling platform in the Danish sector of the North Sea was built in 1971, as Dansk Undergrunds Consortium (DUC) prepared to begin production of crude oil in mid-1972. The platform was located about 120 miles west of Esbjerg. The rate of production was expected to be 15,000 barrels per day. Production from a second location was scheduled to start in 1974, at the same rate of output. The operating company was a subsidiary of Gulf Oil Co., which has a 30-percent interest in DUC; other participants included the Royal Dutch/Shell Group (30 percent), Texaco, Inc. (7.5 percent), Standard Oil Co. of California (7.5 percent), and A. P. Møller of Denmark (25 percent). DUC has tested oil or gas on several other structures in Danish offshore areas, where 21 wells have been drilled and five are productive. Thirty-six holes, all dry, have been drilled onshore. Total investment by DUC in exploration and development by yearend was estimated at about $60 million.

Crude Oil Imports and Refining.—Imports of crude oil in 1971 rose to 10.66 million tons, valued at about $250 million. This was an increase of 5.3 percent in quantity and 28 percent in value, compared with imports in 1970. Refinery throughput and output increased about 4.5 percent in 1971. Stocks of crude oil (518,000 tons at yearend) were essentially unchanged from 1 year earlier.

Imports of petroleum products, principally fuel oils, declined by 800,000 tons, while exports increased by 282,000 tons comprised mainly of distillate fuel oil and gasoline. Inland consumption of petroleum products in 1970 and 1971 is shown by the following provisional figures:

Product	Inland consumption (thousand metric tons)	
	1970	1971
Gasoline	1,535	1,594
Aviation fuels	581	634
Kerosine	225	205
Gas/diesel oil	6,110	6,078
Residual fuel oil	8,155	7,853
Other	758	754
Total	17,364	17,118

Source: Organization for Economic Cooperation and Development (OECD), Paris. Provisional Oil Statistics by Quarters. Fourth Quarter 1971; 1972, pp. 15–21.

ICELAND [14]

Mineral production in Iceland increased substantially in 1971 and contributed its share to a year of outstanding prosperity for the nation. Aluminum production provided the largest part of the increase in value, while sizable gains were also reported in the value of diatomite, nitrogenous fertilizer, and building materials output. Expansions were underway at the aluminum and fertilizer plants, while new projects under consideration included a sea chemicals complex and several mineral processing plants utilizing Iceland's inexpensive hydroelectric power.

The Government that was elected during 1971 announced a policy favoring greater public ownership of production facilities.

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[14] Prepared by David G. Willard.

However, opportunities remain open for the minority participation of private capital in the new projects currently under discussion.

Government Policies and Programs.—Elections in June 1971 removed the former center-right Government from power and replaced it with a coalition of center-left parties. Policies announced by the new Government envisioned a greater degree of public ownership of production and less reliance on foreign private investment. However, possibilities still exist for joint government-private industrial projects involving minority ownership by foreign capital.

A State Investment Development Institute was created to centralize economic planning activities and to administer several previously independently managed government loan funds which are used to finance development projects.

Iceland rejected trade terms offered by the Common Market, in part because the proposed tariffs on Iceland aluminum imported into the Commons Market countries were considered unacceptably high.

PRODUCTION

Increases in output were reported for all of Iceland's most important mineral products in 1971. The Straumsvik smelter turned out 41,000 tons of aluminum, a gain of 8 percent over the 1970 level. Diatomite production at Lake Myvatn jumped 47 percent, from 13,239 tons in 1970 to 19,400 tons in 1971. Output of nitrogenous fertilizer registered a gain of 7 percent. Demands of the booming construction industry raised stone and sand and gravel production by 37 percent and 10 percent respectively.

A partial estimate of the value of mineral production in Iceland indicates that the 1971 output surpassed the previous year's total value by better than 10 percent. More than half of this increase, however, resulted from inflation of the island's currency.

TRADE

The country's balance of mineral trade improved considerably in 1970, the latest year for which data are available. Exports of aluminum and diatomite have dramatically reduced the customary deficit on mineral trade. This gain, combined with a higher average price for Iceland's fish exports, brought the country's nominal deficit on all commodity trade down to its lowest point in 5 years. The balance represents an actual surplus because of the difference in methods of evaluating exports and imports.

Slightly under half of the value of Iceland's mineral imports consists of refined petroleum products. A growing component is the aluminum ore feedstock for the aluminum refinery, which is imported from Surinam. Increases in these two categories plus steel mill products raised total mineral imports 13 percent to $31.3 million, the highest level in the last few years.

Values of all commodity trade and mineral trade for the period 1968 through 1970 is shown in the following tabulation in million dollars:

	1968	1969	1970
Total commodity trade: [1]			
Exports	82.0	107.5	146.4
Imports	137.6	123.2	157.1
Balance	−55.6	−15.7	−10.7
Mineral commodity trade: [1]			
Exports	.3	6.7	20.8
Imports	26.4	27.7	31.3
Balance	−26.1	−21.0	−10.5

[1] Export and import figures are not directly comparable, because exports are valued f.o.b. (cost, only) while imports are valued c.i.f. (cost, insurance, freight). A rule of thumb is that cost represents 90 percent of import value.

Further increases in aluminum and diatomite production probably boosted mineral exports again in 1971, although weakness in the world aluminum market caused the smelter's output to be stockpiled for several months. Since it is likely that mineral imports continued their uptrend, little change is expected in the balance of mineral trade. Exports and imports of mineral commodities in 1969 and 1970 are shown in table 5.

Table 5.—Iceland: Mineral commodity trade

(Metric tons unless otherwise specified)

Commodity	1969	1970
EXPORTS		
METALS		
Aluminum, unwrought	10,536	33,520
Iron and steel scrap	3,625	4,821
NONMETALS		
Diatomite	7,444	13,589
IMPORTS		
METALS		
Aluminum and alloys, unwrought and semimanufactures	3,713	608
Copper and alloys, unwrought and semimanufactures	110	135
Iron and steel, semimanufactures	24,254	15,362
Lead and alloys unwrought and semimanufactures	177	226
Silver and platinum, all forms ... value, thousands	$81	$66
NONMETALS		
Cement	[r] 22,724	--
Clay products:		
Refractory	629	1,022
Nonrefractory	795	887
Cryolite and chiolite	2,193	1,150
Fertilizers manufactured	85,026	81,343
Gypsum and plaster	6,291	--
Pigments, titanium oxides	289	289
Salt	47,770	42,928
Other, building materials of asphalt, asbestos and fiber, cement, and unfired nonmetals, n.e.s	727	1,173
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	2,058	4,585
Carbon black	489	--
Coal, anthracite and bituminous	[r] 2,339	1,664
Petroleum refinery products:		
Gasoline, motor ... thousand 42-gallon barrels	445	454
Kerosine and white spirit ... do	298	490
Distillate fuel oil ... do	1,878	2,349
Residual fuel oil ... do	602	536
Lubricants ... do	35	34
Other:		
Nonlubricating oils, n.e.s ... do	4	6
Bituminous mixtures, n.e.s	11	6
Liquefied petroleum gas ... do	6	7
Total ... do	3,279	3,882

[r] Revised.

COMMODITY REVIEW

Aluminum.—The aluminum smelter at Straumsvik was undergoing further expansion to a total capacity of 77,000 tons per year, 75 percent greater than its previous capacity of 44,000 tons per year.[15] A plan to put an aluminum casting foundry in Iceland was considered by General Motors but was dropped in favor of a foundry in Norway. The reason given for the change was the dependence on a single supplier of aluminum in Iceland, whereas alternative sources are available in Norway.[16]

Diatomite.—The operation at Lake Myvatn reportedly showed improved financial returns in 1971 after incurring startup problems during its initial 4 years.

Fertilizer Materials.—Expansion is underway at the State Fertilizer Plant in Reykjavik. Capacity will be increased from 24,000 tons per year to 65,000 tons per year of nitrogenous fertilizer. The latter figure equals Iceland's present annual fertilizer consumption. Included in the expansion will be the capability to produce mixed fertilizers.[17]

Petroleum.—A new agreement was reached in December 1971 for the purchase of U.S.S.R. petroleum products by Iceland during the period 1972–75. The inclusion of specified amounts of refined petroleum products in the agreement would appear to indicate a lessened interest by the Government in the proposed construction of a petroleum refinery in Iceland.[18]

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[15] Chemical Week. Big Plans for a Hot Resource. V. 108, No. 20, May 19, 1971, p. 30.

[16] U.S. Embassy, Reykjavik, Iceland. State Department Airgram A-37, Apr. 7, 1971, p. 2.

[17] U.S. Embassy, Reykjavik, Iceland. State Department Airgram A-135, Dec. 22, 1971, encl. 1, p. 4.

[18] U.S. Embassy, Reykjavik, Iceland. State Department Airgram A-138, Dec. 27, 1971.

Sea Chemicals.—Feasibility studies continued on the proposed production of chemicals from sea water and geothermal brines. A modified process for the production of magnesium chloride, worked out by Icelandic scientist Baldur Lindal, would be included in the project. A feasibility report by Iceland's National Research Council on the project, provisionally named Sea Chemicals, Ltd., is expected to be ready in 1972.[19]

Other Minerals.—Proposals for several mineral processing plants that would utilize power from upcoming hydroelectric projects are being seriously studied by Icelandic authorities and private companies. Power-intensive export industries would greatly benefit the country, which has ample undeveloped hydroelectric resources and a small labor force. No details are yet available on any of these projects.

SWITZERLAND [20]

Natural mineral resources continued to sustain a modest output of several nonmetallic commodities such as cement, lime, salt and gypsum, since production of these mineral commodities increased 7 percent in 1971. The Swiss aluminum refining industry, based entirely on imported raw materials, continued to be adequate to meet the country's consumption requirements and provided for a small excess of material which was exported as aluminum ingot and semifabricated products. The petroleum refining industry and the steel industry of Switzerland, also based on imported raw materials, met a major portion of the Swiss requirements of these processed mineral commodities.

Switzerland continued to enjoy full employment, a high standard of living, and all the other benefits of a highly diversified economy operating at full capacity. The estimated gross national product (GNP) rose in 1971 to a record high of $26.1 billion, representing a growth rate of 13.2 percent.

Because of the acute labor shortage, Swiss manufacturers were interested in methods of increasing productivity, such as technologically improved assembly line facilities and automated packaging systems, which lessen the dependence on semiskilled manpower.

According to an estimate of 1971 industrial production compiled by the Swiss Federal Statistical Office, production increased slightly. Output and performance varied by sector with a 5-percent growth in the output of the chemicals industry and lesser increases in the metal-working industries. In some cases, the tight labor market prevented full-capacity operation.

The estimated 1971 Swiss GNP, measured in terms of 1971 market prices, increased by a record high of 13.2 percent. Although inflation accounted for 8.7 percent of this figure, the real growth of GNP decreased slightly to 4.5 percent compared with the revised real GNP growth of 5.0 percent in 1970. In an attempt to forestall further inflationary trends, the Federal Government announced its aim to strengthen its powers over fiscal and monetary policy.[21]

The main Swiss energy source, petroleum, continued to supply about three-fourths of the nation's total energy consumption in 1971. Petroleum product consumption increased almost 6 percent and totaled 100.4 million barrels during the year. While imports of crude oil decreased 6 percent to 39.0 million barrels in 1971, the main source continued to be Libya which supplied 49 percent of the total crude imports. In addition, the other major sources of crude oil imports into Switzerland during 1971 were Saudi Arabia, 15 percent, Algeria and Kuwait, 14 percent each, and Tunisia, 6 percent. The balance was received from Nigeria and Iran. Refinery products imported during the year increased 3 percent and totaled 62.1 million barrels, of which about 90 percent was obtained from sources in the European Economic Community (EEC), primarily from West Germany, Italy, and France.

Hydroelectric and nuclear power accounted for about 16 percent of the total Swiss energy consumption, coal provided about 4 percent, fuel wood provided about 2 percent, and imported gas supplied the remainder.

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[19] Source cited in footnote 15.

[20] Prepared by Richard F. Stevens, Jr.

[21] U.S. Embassy, Bern, Switzerland. State Department Airgram A-207, May 10, 1972, 8 pp.

Switzerland's first nuclear reactor, Beznau I, a pressurized water reactor moderated and cooled with light water, which began full operation in February 1970, had a net electrical capacity of 350 megawatts and reportedly supplied about one-tenth of the country's energy requirements. A second, identical reactor, Beznau II, is being built on the same site and is scheduled to become operational in early 1972.[22] A third reactor, the Mühleberg nuclear powerplant, was also scheduled to become operational in 1972 but suffered extensive fire damage in the nonnuclear turbine area, its operation will be delayed for a year. When it becomes operational, the Mühleberg system will be a boiling-water reactor with an electrical capacity of 306 megawatts. Plans for the construction of two additional nuclear power stations, Kaiseraugst and Leibstadt, which were well advanced, have been temporarily shelved pending a decision by the Swiss Federal Council on the potential ecological impact of these systems on the environment. Plans call for the Kaiseraugst facility to have a boiling-water reactor system with an electrical capacity of 850 megawatts. The Leibstadt power station will use a light-water reactor (exact system not decided) and have an electrical capacity of 600 megawatts.

To meet the rapidly growing electrical power demand, Switzerland will have to build at least another eight large nuclear power stations with capacities averaging or exceeding 1,000 megawatts before 1986. Three of these additional nuclear power stations are in the design stage and sites have been selected at Gösgen, Graben, and Verbois.

The 1971–72 annual report of the Office Vaudois por le Dévelopment du Commerce et de l'Industrie (OVCI) included an informative energy status report, "Bilan et Perspectives Energétiques," which evaluated Switzerland's past, present, and future energy needs and sources. The status report also evaluates the need for nuclear power generation and for the country's connection to an international network of natural gas supply. Copies of this report, published in French, are available for SF 12 (approximately $3.25) per copy from OVCI, P.O. Box 1933, 1005 Lausanne, Switzerland.

Because of its landlocked location in Western Europe and the absence of substantial indigenous mineral resources, the Swiss economy continued to be highly dependent upon trade to supply raw and semiprocessed mineral materials. During 1971, imports of some raw materials and partly processed goods dropped, while imports of consumer goods increased nearly 18 percent and imports of capital goods rose nearly 10 percent.[23]

The relationship between Swiss mineral commodity trade and total trade is indicated in the following tabulation:

	Value (million dollars)		Mineral commodities share of total (percent)
	Mineral commodity trade	Total commodity trade	
Exports:			
1968	234	3,951	5.9
1969	296	4,610	6.4
1970	276	5,120	5.4
Imports:			
1968	854	4,494	19.0
1969	991	5,266	18.8
1970	1,257	6,471	19.4
Trade Balance:			
1968	−620	−543	XX
1969	−695	−656	XX
1970	−981	−1,351	XX

XX Not applicable.

During 1970, nonferrous metal exports, primarily aluminum products, constituted about 35 percent of the total mineral exports by value or almost $96 million. Precious and semiprecious stones contributed 28 percent, or $78.5 million, to total mineral exports. The Western European countries of the EEC and the European Free Trade Association (EFTA) continued to be the principal recipients of Swiss mineral exports in 1970.

The largest major group of mineral commodity imports in 1970, iron and steel, contributed 35 percent, or almost $445 million, to total Swiss mineral imports. Imports of mineral fuels valued at $356 million contributed 28 percent and nonferrous imports totaled $257 million and represented 20 percent of the total. Imports of gems and semiprecious stones in 1970 were valued at $81 million or 6 percent of the total. The EEC continued to be the source of the major portion of Swiss mineral imports in 1970.

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[22] U.S. Embassy, Bern, Switzerland. State Department Airgram A–337, Sept. 10, 1971, pp. 11–12.

[23] Campbell, Howard E. Switzerland Multi-Billion Dollar Market. Canada Commerce (Montreal, Canada). V. 136, No. 4, April 1972, pp. 15–16.

A new company, Trans Europa Natugas Pipeline, was formed by West Germany's Ruhrgas and Italy's Snam to construct a 300-mile natural gas pipeline through West Germany. This pipeline will supply natural gas to Switzerland and Italy and will link up with other networks near Aachen and Basle.

Consumption of refined petroleum products in Switzerland, approximately 40 percent of which was domestically refined from imported crude oils and the remainder of which was imported as refined products, is indicated in the following tabulation in millions of barrels:

Products	1970	1971[p]
Motor and aviation gasoline	18.1	20.1
Kerosine and jet fuel	4.5	4.4
Distillate fuel oil	48.2	51.3
Residual fuel oil	15.3	15.8
Lubricants (including greases)	.6	.6
Other refined products	5.1	5.4
Refinery fuel and loss	3.3	2.8
Total	95.1	100.4

[p] Preliminary.

Sources: Bureau of Mines International Petroleum Annual, 1970. March 1972, 37 pp.; and Bureau of Mines International Petroleum Annual, 1971. March 1973, 32 pp.

Table 6.—Switzerland: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum:			
Oxide and hydroxide	126	141	West Germany 60; United States 11; Finland 10.
Metal including alloys:			
Unwrought	18,277	14,442	West Germany 6,896; Italy 2,312; United Kingdom 2,129.
Semimanufactures	28,779	30,980	United Kingdom 3,567; Denmark 3,191; Austria 3,181; Sweden 2,515.
Antimony metal including alloys, all forms	16	11	Mainly to West Germany.
Arsenic trioxide, pentoxide and acids	--	3	Mainly to Mexico.
Chromium, oxide and hydroxide	3	17	Yugoslavia 15.
Columbium and tantalum metal including alloys, all forms	13	2	West Germany 1; Poland 1.
Copper:			
Matte	[r] 637	503	Belgium-Luxembourg 362; West Germany 91; France 49.
Metal including alloys:			
Scrap	17,945	12,911	West Germany 6,307; Italy 1,907; Austria 1,267.
Unwrought	3,959	3,959	West Germany 1,719; Italy 1,663.
Semimanufactures	9,494	8,314	United States 1,435; Italy 1,338; Israel 1,160.
Gold metal, unworked or partly worked thousand troy ounces	843	753	West Germany 508; Denmark 57; Austria 46.
Iron and steel:			
Ore and concentrate	13,246	5,192	West Germany 5,128.
Scrap	27,251	26,695	Italy 13,563; West Germany 6,960; France 3,103.
Pig iron, ferroalloys and similar materials	11,701	12,317	West Germany 5,338; Italy 3,989; Austria 1,427.
Steel, primary forms	4,403	7,029	Italy 5,572; West Germany 1,385.
Semimanufactures	104,637	95,951	Italy 18,359; Austria 15,869; United States 9,551; West Germany 9,071.
Lead:			
Oxides	8	1	Mainly to West Germany.
Metal including alloys, all forms:			
Scrap	8,367	7,165	Italy 6,329; Austria 654.
Unwrought and semimanufactures	486	470	Austria 195; Italy 173.
Magnesium metal including alloys, all forms	150	97	West Germany 66.
Mercury 76-pound flasks	61	87	France 29.
Nickel:			
Matte, speiss and similar materials	46	132	West Germany 91; Netherlands 15.
Metal including alloys, unwrought and semimanufactures	1,454	1,169	West Germany 179; Italy 163; France 150.
Platinum-group metals and silver including alloys:			
Platinum group thousand troy ounces	146	113	Italy 50; France 22.
Silver do	8,324	9,253	Italy 3,651; West Germany 2,089; France 719.

See footnotes at end of table.

Table 6.—Switzerland: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS—Continued			
Tantalum	13	2	Mainly to Poland.
Tin metal including alloys:			
Scrap long tons	98	106	West Germany 44.
Unwrought and semimanufactures do	64	243	West Germany 72; United Kingdom 45; Austria 37.
Titanium oxides	92	29	West Germany 11; France 7.
Zinc, scrap	1,452	1,271	Italy 786.
Other:			
Ore and concentrate of molybdenum, tantalum, vanadium, and zirconium	86	101	Yugoslavia 60; West Germany 37.
Ash and residue containing nonferrous metals	20,233	19,801	West Germany 7,169; Italy 6,573; Belgium-Luxembourg 3,740.
Oxides, hydroxides and peroxides of metals, n.e.s	82	76	West Germany 12.
Metals including alloys, all forms:			
Metalloids	7,678	6,915	West Germany 4,808; Spain 895.
Base metals, including alloys, all forms, n.e.s	66	58	West Germany 32.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	52	22	NA.
Dust and powder of precious and semiprecious stones	12	10	West Germany 2; Italy 2.
Grinding and polishing wheels and stones	708	818	West Germany 208; United Kingdom 152.
Asbestos	50	66	Austria 25; West Germany 24.
Boron materials:			
Crude natural borates	--	19	NA.
Oxide and acid	2	2	Mainly to West Germany.
Cement	101,219	80,832	West Germany 61,168; France 13,100.
Chalk	85	51	France 26; West Germany 16.
Cryolite and chiolite	11	1	NA.
Clays and products (including all refractory brick):			
Refractory (including nonclay bricks)	1,341	1,181	NA.
Nonrefractory	61,482	56,154	France 20,962; West Germany 19,625; Austria 11,926.
Diamond:			
Gem, not set or strung value, thousands	$14,954	$20,451	West Germany $4,805; France $3,978; Belgium-Luxembourg $336.
Industrial do	$998	$2,076	Belgium-Luxembourg $652; United Kingdom $532; West Germany $439.
Diatomite	136	130	Austria 73; Italy 50.
Feldspar and fluorspar	144	962	West Germany 816; Sweden 60.
Fertilizer materials, manufactured, nitrogenous	9,522	4	West Germany 2.
Graphite, natural	6	28	West Germany 27.
Gypsum and plasters	2,392	2,370	Austria 2,254.
Lime	2,232	2,283	France 1,598; West Germany 608.
Magnesite	42	51	West Germany 25.
Mica:			
Crude including splittings and waste	93	74	France 24; Sweden 15; Ireland 13.
Worked including agglomerated splittings	216	258	Sweden 44; Netherlands 32; Austria 29.
Pigments, mineral including processed iron oxides	42	91	Peru 20.
Precious and semiprecious stones, except diamond:			
Natural thousand carats	40,390	29,545	West Germany 6,365; Italy 4,990.
Manufactured do	179,365	241,665	West Germany 63,915; Italy 48,155.
Salt and brine	1,186	1,456	West Germany 1,454.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	16,987	11,133	Italy 3,025; France 2,964; West Germany 2,357.
Caustic potash, sodic, and potassic peroxides	1	1	NA.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	38,398	42,093	West Germany 26,530; Austria 5,368.
Worked	9,006	9,171	West Germany 7,942.
Dolomite	78	59	Netherlands 40.
Gravel and crushed rock	48,198	55,090	West Germany 31,807.
Limestone (except dimension)	[r] 1	2	All to Italy.
Quartz and quartzite	23,585	31,517	Italy 25,525.
Sand excluding metal-bearing	13,524	14,213	France 6,931; West Germany 5,640.

See footnotes at end of table.

Table 6.—Switzerland: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
NONMETALS—Continued			
Sulfur:			
Elemental	236	129	West Germany 122.
Sulfur dioxide	125	369	Austria 340.
Sulfuric acid	12,748	13,645	West Germany 12,969; France 388.
Talc, steatite, soapstone, and pyrophyllite	1,739	2,432	Italy 1,516; West Germany 835.
Other nonmetals, n.e.s.:			
Slag, dross and similar waste, not metal bearing	5,395	883	West Germany 476; Italy 69.
Bromine, iodine, and fluorine	22,577	1,904	France 1,110.
Building materials of asphalt, asbestos and fiber cement and unfired nonmetals, n.e.s	5,493	3,216	West Germany 1,416; Austria 268.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	8	25	Belgium-Luxembourg 19.
Carbon black	310	102	West Germany 30; Italy 24; U.S.S.R. 15.
Coal, all grades, including briquets	3,974	35,475	West Germany 33,744; Austria 1,730.
Coke and semicoke	52,886	28,805	West Germany 10,487; Italy 8,884; Austria 8,206.
Peat, including peat briquets and litter	112	261	Austria 136; West Germany 101.
Petroleum refinery products:			
Gasoline, motor thousand 42-gallon barrels	240	132	Mainly to Austria.
Distillate fuels do	196	154	Do.
Residual fuels do	1,280	1,412	Do.
Lubricants do	11	9	Italy 4; Austria 2.
Other:			
Petroleum coke do	6	32	West Germany 19; France 13.
Bituminous mixtures, n.e.s. do	3	2	NA.
Total do	1,736	1,741	

r Revised. NA Not available.

Table 7.—Switzerland: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum:			
Bauxite and concentrate	296	2,641	Italy 2,181; United Kingdom 141.
Oxide and hydroxide	149,437	176,185	West Germany 109,990; Guinea 37,839.
Metal, including alloys:			
Unwrought	19,122	22,119	Norway 11,740; Iceland 5,932.
Semimanufactures	10,654	10,914	West Germany 4,032; Sweden 1,286; Norway 1,164.
Antimony including alloys, all forms	r 211	154	Japan 45; Turkey 35; Belgium-Luxembourg 27.
Arsenic trioxide, pentoxide, and acids	95	76	France 51.
Beryllium including alloys, all forms	19	46	West Germany 34.
Chromium:			
Chromite	4,055	3,019	Republic of South Africa 2,622.
Oxide and hydroxide	634	809	West Germany 487; Italy 170; France 51.
Cobalt oxide and hydroxide	10	16	Belgium-Luxembourg 15.
Copper including alloys:			
Scrap	511	397	Israel 212; West Germany 107.
Unwrought	41,338	51,815	Belgium-Luxembourg 14,617; West Germany 12,912.
Semimanufactures	27,266	43,957	United Kingdom 18,827; West Germany 10,227.
Gold, unworked and partly worked thousand troy ounces	373	383	West Germany 294; United States 37.
Iron and steel:			
Ore and concentrate, including roasted pyrite	38,255	33,573	Mauritania 24,593; Italy 7,289.
Scrap	21,714	51,166	West Germany 43,929; Poland 5,072.
Pig iron including cast iron, sponge iron, spiegeleisen, powder and shot	64,264	91,341	West Germany 71,714; Canada 6,313; Norway 5,013.
Ferroalloys	17,150	18,472	West Germany 4,498; Norway 2,309; U.S.S.R. 2,269.
Steel, primary forms	203,905	307,075	France 72,286; United States 54,736; Belgium-Luxembourg 38,607.

See footnote at end of table.

Table 7.—Switzerland: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS—Continued			
Iron and steel—Continued			
Semimanufactures:			
Bars, rods, angles, shapes and sections:			
Wire rod thousand tons	76	89	France 31; West Germany 28.
Other bars and rods do	193	279	West Germany 96; Italy 56; France 49.
Angles, shapes and sections do	243	273	West Germany 94; Belgium-Luxembourg 78; France 73.
Universals, plates and sheets do	695	589	West Germany 181; France 157.
Hoop and strip do	189	208	Belgium-Luxembourg 70; West Germany 57.
Rails and accessories do	45	45	Austria 17; West Germany 7; Belgium-Luxembourg 7.
Wire do	29	37	Austria 12; West Germany 12; United Kingdom 3.
Tubes, pipes, and fittings do	156	180	West Germany 78; France 29; Austria 16; United Kingdom 14.
Castings and forgings, rough do	2	3	West Germany 1.
Total do	1,628	1,703	
Lead:			
Oxides	379	300	West Germany 140.
Metal including alloys:			
Scrap	25	11	West Germany 10.
Unwrought	25,965	26,028	West Germany 5,713; France 4,831; Belgium-Luxembourg 4,168.
Semimanufactures	782	738	West Germany 656
Magnesium including alloys, all forms	r 1,159	1,504	Norway 736; Canada 385; United States 223.
Manganese oxides	780	459	Japan 220.
Mercury 76-pound flasks	754	2,030	Spain 1,189; Yugoslavia 348.
Molybdenum including alloys, all forms	11	15	Austria 7; United Kingdom 4.
Nickel:			
Matte, speiss, and similar materials	2,180	2,218	United Kingdom 777; Norway 431; West Germany 210.
Metal, including alloys:			
Scrap	119	15	West Germany 8; Israel 7.
Unwrought	2,109	2,010	United Kingdom 733; Norway 431; West Germany 200.
Semimanufactures	1,278	1,835	West Germany 758; United Kingdom 516; France 215.
Platinum-group metals including alloys, all forms thousand troy ounces	123	92	West Germany 63; France 13.
Silicon, including alloys, all forms	151	476	Italy 195; Norway 102; United States 52.
Silver, including alloys, all forms thousand troy ounces	7,468	10,660	West Germany 2,991; United Kingdom 2,497; United States 2,275.
Tantalum	2	5	Mainly from West Germany.
Tin:			
Oxides	24	43	United Kingdom 21.
Metal including alloys, all forms:			
Scrap	--	4	All from West Germany.
Unwrought	928	945	Malaysia 353; Netherlands 309.
Semimanufactures	156	173	West Germany 86; Netherlands 54.
Titanium oxides	8,918	8,732	West Germany 2,702; United Kingdom 2,222; France 1,530.
Tungsten:			
Ore and concentrate	20	30	Portugal 20.
Metal including alloys, all forms	105	99	West Germany 83; France 11.
Zinc:			
Oxide	1,414	1,692	West Germany 832; France 351; Netherlands 256.
Metal, including alloys:			
Scrap	1	21	Mainly from Belgium-Luxembourg.
Blue powder	3,531	4,004	Belgium-Luxembourg 2,661; West Germany 697.
Unwrought	31,057	27,367	West Germany 9,465; Belgium-Luxembourg 6,400.
Semimanufactures	1,742	1,731	West Germany 936; Belgium-Luxembourg 635.
Other:			
Ore and concentrate of molybdenum, tantalum, vanadium, and zirconium	3,197	3,034	Australia 2,748.

See footnote at end of table.

Table 7.—Switzerland: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS—Continued			
Other—Continued			
Ash and residue containing nonferrous metals	1,015	1,561	West Germany 1,272; France 289.
Oxides, hydroxides and peroxides of metals, n.e.s	1,208	1,157	West Germany 836; Hungary 150.
Metals including alloys, all forms:			
Metalloids	2,414	2,512	Netherlands 1,011; France 595.
Alkali, alkaline earths and rare-earth metals	393	396	West Germany 358; United States 32.
Pyrophoric alloys	11	13	NA.
Base metals, including alloys, all forms n.e.s	816	869	Japan 198; Republic of South Africa 138; France 113.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	2,117	1,556	Italy 786.
Grinding and polishing wheels and stones	1,515	1,701	West Germany 795; United Kingdom 229; Austria 200.
Asbestos	15,713	17,721	Canada 9,787; U.S.S.R. 3,240; Republic of South Africa 2,326.
Barite and witherite	1,769	2,606	West Germany 1,421.
Boron materials:			
Crude natural borates	1,247	1,343	United States 1,251.
Oxide and acid	3,907	468	Turkey 232; France 183.
Cement	34,957	49,972	West Germany 19,816; France 17,443.
Chalk	15,397	18,013	France 15,746.
Clays and products (including all refractory brick):			
Crude n.e.s	176,206	206,211	West Germany 85,219; United Kingdom 61,906; France 35,550.
Cryolite and chiolite	550	745	All from Denmark.
Diamond:			
Gem, not set or strung value, thousands	$34,486	$36,613	Belgium-Luxembourg $11,148; Israel $5,567; France $5,149.
Industrial do	$2,313	$2,076	Belgium-Luxembourg $652; United Kingdom $532; West Germany $439.
Diatomite and other infusorial earths	2,601	2,024	United States 552.
Feldspar and fluorspar	17,216	15,719	France 7,488; West Germany 4,514; Italy 3,314.
Fertilizer materials:			
Crude:			
Nitrogenous	543	622	All from West Germany.
Phosphatic	21,679	11,191	Morocco 7,656; Belgium-Luxembourg 1,911.
Potassic	86,296	84,933	France 63,681; West Germany 10,686.
Other	18,152	18,747	France 17,794.
Manufactured:			
Nitrogenous	3,136	7,806	Austria 3,038; West Germany 2,352.
Phosphatic:			
Thomas (basic) slag	193,654	184,833	France 119,424; Belgium-Luxembourg 65,399.
Other	17,132	18,168	Belgium-Luxembourg 6,518; France 4,859; Netherlands 2,180.
Potassic	22,176	23,038	West Germany 13,738; France 5,970.
Other including mixed	38,418	54,544	West Germany 25,694; Belgium-Luxembourg 12,269.
Ammonia	15,693	10,579	Austria 7,318; France 2,116.
Graphite, natural	353	399	West Germany 203.
Gypsum and plasters	80,035	79,148	West Germany 43,585.
Lime	20,887	26,671	Italy 15,577; West Germany 9,422.
Magnesite	3,785	4,012	Austria 3,667.
Mica:			
Crude including splittings and waste	756	771	West Germany 324; India 122.
Worked including agglomerated splittings	126	258	France 177; Belgium-Luxembourg 76.
Pigments, mineral:			
Natural crude	389	422	West Germany 167; France 91.
Iron oxides processed	780	2,807	West Germany 2,703.
Precious and semiprecious stones, except diamond:			
Natural thousand carats	176,200	373,615	Italy 156,075; United States 84,125.
Manufactured do	121,435	131,510	France 123,865.
Pyrite (gross weight)	32,359	17,520	Italy 17,470.
Salt and brine	1,119	3,034	West Germany 1,923.

See footnote at end of table.

Table 7.—Switzerland: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
NONMETALS—Continued			
Sodium and potassium compounds, n.e.s.:			
Caustic soda	8,954	11,133	Italy 3,025; France 2,964; West Germany 2,357.
Caustic potash, sodic and potassic peroxides	3,689	3,583	West Germany 1,062; France 858; East Germany 717.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous	47,471	49,579	Austria 21,637; Italy 19,730.
Other	39,964	51,555	France 19,506; West Germany 19,392.
Worked:			
Slate	1,440	1,373	Italy 695.
Paving and flagstone	31,394	39,574	Italy 27,574; Austria 10,982.
Other	9,527	9,969	Italy 6,968; West Germany 984.
Dolomite	13,181	13,298	Italy 7,438; France 4,136.
Gravel and crushed rock thousand tons	4,086	4,447	France 2,595; West Germany 1,067; Italy 530.
Limestone (except dimension)	47,822	44,824	France 38,045.
Quartz and quartzite	23,859	24,417	Italy 8,634; Belgium-Luxembourg 8,563.
Sand excluding metal bearing	828,432	949,635	Italy 426,566; France 198,532; West Germany 164,570.
Sulfur:			
Elemental:			
Other than colloidal	55,123	64,739	France 30,927; United States 19,713.
Colloidal	210	288	West Germany 208.
Sulfur dioxide	23	22	France 11.
Sulfuric acid	860	1,051	West Germany 688.
Talc, steatite, soapstone, and pyrophyllite	11,384	13,935	Austria 7,460; France 3,639.
Other nonmetals, n.e.s.:			
Crude	25,273	27,261	West Germany 15,225.
Slag, dross and similar waste, not metal bearing	23,577	30,971	France 14,403; West Germany 13,010.
Oxides and hydroxides of magnesium, strontium, and barium	441	490	United Kingdom 117.
Bromine, iodine and fluorine	1,535	1,904	France 1,110; United Kingdom 456.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	2,054	1,199	Trinidad and Tobago 775.
Carbon black	8,345	9,595	France 3,249; Netherlands 2,235.
Coal and briquets:			
Anthracite and bituminous coal thousand tons	517	398	West Germany 186; United States 73; Poland 52.
Briquets of anthracite and bituminous coal do	28	38	West Germany 24; France 8.
Lignite and lignite briquets do	94	103	West Germany 93.
Coke and semicoke do	233	289	West Germany 187; France 45.
Hydrogen, helium and rare gases	239	488	West Germany 277; France 167.
Peat and peat briquets and litter	45,027	46,047	West Germany 39,704; Poland 4,793.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	37,442	40,653	Algeria 5,762; Bahrain 4,570; Kuwait 4,421.
Refinery products:			
Gasoline, motor do	11,492	11,662	Italy 3,849; West Germany 3,677; France 2,634.
Kerosine and white spirit do	549	722	Italy 352; France 139; West Germany 95.
Distillate fuel oil do	30,810	34,271	West Germany 8,310; France 8,378; Italy 7,729.
Residual fuel oil do	3,988	5,805	West Germany 3,189; France 1,356; Italy 703.
Lubricants do	563	643	Italy 184; Netherlands 114; West Germany 98.
Mineral jelly and wax do	79	89	West Germany 51; France 8.
Other:			
Petroleum coke do	279	273	United States 133; West Germany 115.
Bitumen and other residues do	1,335	1,531	West Germany 633; France 522.
Bituminous mixtures, n.e.s. do	32	35	West Germany 16; United States 6.
Mineral tar and other coal–, petroleum–, or gas–derived crude chemicals	16,491	22,330	France 12,789; East Germany 4,717; West Germany 4,588.

[r] Revised. NA Not available.

The Mineral Industry of Other African Areas

By Staff, Bureau of Mines

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BOTSWANA [1]

The mineral industry of Botswana contributed about 7 percent of the gross domestic product estimated at about $75 million [2] in 1971. Agriculture was the dominant industry in Botswana, especially animal husbandry. About 84 percent of the population was engaged in some form of agriculture, mainly outside of the cash economy. Although the mineral industry is small, it has the potential to make a significant contribution to the economy of the country. The new diamond mine at Orapa, which began producing at midyear, and the copper-nickel deposits being developed at Selebi and Pikwe, together with supporting infrastructure, should increase government revenue, employment, gross national product, and exports and improve the country's balance of payments.

The Botswana Government and the U.S. Agency for International Development signed a $6.5 million loan agreement to finance a 50-mile water pipeline from the Shashe Dam to the mining complex at Selebi-Pikwe. Additional loans to cover a total investment of about $212 million in the mining complex and infrastructure known as the Shashe project were scheduled to come from individual countries—West Germany, Canada, Republic of South Africa, the United Kingdom—and from the World Bank and International Development Association. Approximately $71 million of the total will be invested in infrastructure, which includes a dam, water facilities, hydroelectric project, roads, a hospital, township, and rail connection. Reportedly, the development policies of Botswana have fostered confidence among the several governments, international agencies, and various mining groups, which have invested massive financial resources in Botswana. The Government of Botswana reassured these groups that it recognized the contribution that private investment could make to a developing country and would work to implement the creation of a stable climate for investment in Botswana.

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[1] Henry E. Stipp, physical scientist, Divison of Ferrous Metals.

[2] Where necessary, values have been converted from South African Rand (R) to U.S. dollars at the rate of R1=US$1.40.

Botswana, a country about the size of France, had a population of only 625,000 persons in 1971 of which only about 100,000 workers were employed as wage earners in 1971, and nearly two-thirds of these worked outside Botswana in the mines, industry, and services of the Republic of South Africa.

Production of mineral commodities in 1971 was valued at an estimated $7.7 million compared with $70,000 in 1970. The output of diamond, mainly industrial, which began in June, was responsible for the sharp increase in value of mineral production in 1971. Statistics on production are shown in table 1.

Production of copper-nickel matte from the Selebi-Pikwe mine and smelter was scheduled to begin early in 1974.[3] A total investment of nearly $214 million will have to be made in Botswana before production of refined nickel and copper begins. About $9.4 million was spent on exploration, on metallurgical and feasibility studies, and on bringing ore reserves up to 43 million tons of proven and probable ore by early 1971. Present plans for development of the mining complex include the mine at Pikwe and an ore body at nearby Selebi, which will be developed in 1979. Reserves at these two deposits should be sufficient for 23 years production at an annual rate of 2 million tons of ore. After crushing, grinding, and concentrating, ore will be treated in a large new smelter at Pikwe, where 45,000 tons per year of a nickel-copper matte and about 125,000 tons per year of elemental sulfur will be produced. The matte will be shipped to the Port Nickel refinery on the Mississippi River below New Orleans, where it will be refined into about 14,800 tons of nickel and 16,600 tons of copper.

The refined nickel and copper will be shipped to West Germany for sale by Metallgesellschaft A.G. backed by American Metal Climax Corp. (AMAX). The sulfur from the smelter at Pikwe will be marketed in the Republic of South Africa. Financing for the mining complex will come from two main sources. About $69.7 million will be provided by a West German Government investment bank and a consortium of German commercial banks. This loan is to be repaid in 10 years after 1977, at an effective interest rate of 9-3/4 percent. The remaining $18 million loan financing will come from the Industrial Development Corporation of South Africa. The loan is repayable in 10 years after 1974, at an interest rate of 6½ percent. In addition to these loans, financing also will be provided by shareholders of Botswana Roan Selection Trust (BRST), AMAX, and Anglo-American Corp. Infrastructure for the project will be provided by the Government of Botswana through loans from foreign government agencies and international financial institutions. Early in 1971, Anglo-American Corp. purchased (for $3 million) a small manganese mine located near Kanye, southern Botswana, from Botswana Exploration & Mining Co. The mine, which has a lease area of 316 square miles, produced about 5,400 tons of manganese dioxide ore in 1971. At yearend, Anglo-American Corp. announced that it would stop manganese mining operations because of poor prospecting results and the low price for manganese ore and concentrate in world markets.

The Orapa diamond mine of De Beers Botswana Mining Co. (Pty.) Ltd. began operation in June 1971. Reportedly, De Beers spent about $30.1 million in prospecting and construction of the mine, mill, and infrastructure.[4] The mine, an open pit operation that produced initially 7,750 tons per day of kimberlite ore, was scheduled to reach full production of 8,000 tons per day by yearend. It is expected that output will exceed 2 million carats of low-grade industrial diamond in 1972. Infrastructure consists of 162 houses and single quarters for 210 workers, a hospital, clinic, school and training center. A 140-mile all-weather road from the railhead at Francistown to Orapa and telephone facilities were constructed by the Government through a $2.7 million loan from De Beers. The Government of Botswana has a

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[3] Ostrander, F. Taylor. Botswana Nickel-Copper —A Case Study in Private Investment's Contribution to Economic Development. March 1972, 11 pp.

[4] U.S. Embassy, Gaborone. State Department Airgram A-56, June 13, 1972, p. 1.

Table 1.—Other African Areas: Production of mineral commodities

Country, commodity, and unit of measure [1]	1969	1970	1971 [p]
BOTSWANA [2]			
Diamond:			
Gem carats	NA	54,401	87,176
Industrial do	NA	489,605	784,589
Total do	NA	544,006	871,765
Gem stones, semiprecious, rough, not further described kilograms	6,044	12,584	47,465
Manganese ore and concentrate, gross weight metric tons	[r] 22,244	48,311	34,248
Talc do	51	36	130
BURUNDI [3]			
Lime do	800	120	NA
Rare-earth metals, bastnaesite concentrates, gross weight do	600	300	NA
Tin ore and concentrate:			
Gross weight long tons	108	62	[e] 65
Metal content do	83	48	[e] 50
CAMEROON [2]			
Aluminum metal, primary metric tons	46,737	52,372	50,693
Cement, hydraulic do	--	30,000	140,000
Gold, mine output, metal content troy ounces	[r] 193	235	96
Tin ore and concentrate:			
Gross weight long tons	44	59	30
Metal content do	29	35	22
CENTRAL AFRICAN REPUBLIC [2]			
Diamond:			
Gem [e] carats	347,956	313,591	284,342
Industrial [e] do	187,361	168,856	153,107
Total do	535,317	482,447	437,449
CHAD [2]			
Natron:			
Slabs metric tons	3,200	[e] 3,200	[e] 3,500
Broken do	3,500	[e] 3,500	[e] 3,500
CONGO (BRAZZAVILLE) [2]			
Copper, mine output, metal content do	11	129	1,647
Fertilizer materials, potash, crude, K_2O equivalent do	80,778	125,087	260,857
Gas, natural:			
Gross production [e] million cubic feet	121	96	90
Marketable production do	97	[e] 36	[e] 35
Gold, mine output, metal content troy ounces	3,922	2,669	2,974
Lead, mine output, metal content metric tons	341	53	29
Petroleum, crude thousand 42-gallon barrels	173	137	130
Tin, mine output, metal content long tons	[r] 48	[r] 48	48
Zinc, mine output, metal content metric tons	682	107	633
ETHIOPIA [2]			
Cement, hydraulic thousand metric tons	166	181	211
Clays, kaolin metric tons	12,497	10,453	10,285
Feldspar do	11,643	--	--
Gold, mine output, metal content troy ounces	42,400	27,282	21,226
Gypsum and anhydrite, crude metric tons	5,191	4,650	3,582
Lime do	17,980	17,590	14,380
Limestone do	106,121	152,960	148,720
Petroleum refinery products:			
Motor gasoline thousand 42-gallon barrels	585	583	659
Jet fuel do	200	239	300
Kerosine do	19	--	4
Distillate fuel oil do	1,011	1,191	1,405
Residual fuel oil do	1,365	1,550	1,815
Liquefied petroleum gas do	29	27	39
Asphalt do	50	98	126
Refinery fuel and losses do	429	509	647
Total do	3,688	4,197	4,995
Platinum, mine output, metal content troy ounces	343	273	217
Pumice metric tons	NA	8	--
Salt:			
Rock do	4,000	10,000	10,000
Marine do	230,000	250,000	280,000
Total do	234,000	260,000	290,000

See footnotes at end of table.

Table I.—Other African Areas: Production of mineral commodities—Continued

Country, commodity, and unit of measure[1]	1969	1970	1971[p]
GUINEA[2]			
Aluminum:			
Bauxite ... thousand metric tons	2,459	2,490	2,630
Alumina ... metric tons	572,460	610,070	665,000
Diamond:			
Gem[e] ... carats	22,000	22,000	22,000
Industrial[e] ... do	50,000	52,000	52,000
Total[e] ... do	72,000	74,000	74,000
Gold, mine output, metal content ... troy ounces	3,922	[e]4,000	[e]4,000
IVORY COAST[2]			
Cement, hydraulic ... thousand metric tons	388	400	500
Columbium and tantalum, tantalite concentrate, gross weight ... kilograms	211	--	--
Diamond:			
Gem[e] ... carats	80,965	85,123	130,548
Industrial[e] ... do	121,448	127,685	195,822
Total ... do	202,413	212,808	326,370
Manganese ore and concentrate, gross weight ... metric tons	127,050	23,060	--
Petroleum refinery products:			
Gasoline ... thousand 42-gallon barrels	1,354	1,435	1,292
Jet fuel ... do	319	317	320
Kerosine ... do	306	375	388
Distillate fuel oil ... do	1,613	1,469	1,790
Residual fuel oil ... do	1,730	1,474	1,898
Other ... do	121	116	70
Refinery fuel and losses ... do	248	224	248
Total ... do	5,691	5,410	6,006
LESOTHO[2]			
Diamond:			
Gem ... carats	4,787	3,502	1,010
Industrial ... do	25,000	13,037	5,805
Total ... do	29,787	16,539	6,815
MALAGASY REPUBLIC[2]			
Abrasives, natural:			
Corundum ... kilograms	800	1,900	1,465
Garnet (industrial only) ... do	2,082	40,100	40,500
Beryllium, beryl concentrate, industrial, gross weight ... metric tons	83	52	60
Cement, hydraulic ... thousand metric tons	75	75	77
Chromium, chromite concentrate, gross weight ... metric tons	80,000	141,000	140,000
Clays, kaolin ... do	800	989	1,969
Feldspar ... do	--	1	1
Gem and ornamental stones:			
Agate ... kilograms	1,800	2,700	25,194
Amazonite ... do	2,300	10,500	7,208
Amethyst:			
Gem ... do	10	13	11
Geodes ... do	5,200	6,900	9,100
Apatite (ornamental only) ... do	--	1,500	--
Aragonite ... metric tons	488	829	867
Beryl:			
Gem ... kilograms	1	1	36
In quartz ... do	550	453	150
Calcite (ornamental only) ... do	4,800	19,600	1,600
Celestine ... do	6,100	7,700	12,800
Cipoline marble ... metric tons	1,147	1,429	1,122
Citrine, gem ... kilograms	39	19	13
Cordierite, gem ... do	150	100	--
Diopside, gem ... do	700	750	850
Garnet:			
Gem ... do	200	33	40
Other ornamental ... do	6,800	3,600	3,300
Jasper ... do	140	38,900	320
Labradorite ... do	7,083	45,100	7,900
Quartz:			
Rose quartz ... do	6,900	19,800	69,600
Geodes ... do	1,300	8,900	1,200
Other ornamental ... do	15,700	15,100	45,100
Rhodonite ... do	--	33,200	56,000
Tourmaline, black ... do	1,400	1,800	1,100
Tourmaline, in quartz ... do	--	700	2,300
Gold, mine output, metal content ... troy ounces	646	514	412
Graphite, all grades ... metric tons	[r]17,114	19,870	20,025

See footnotes at end of table.

Table 1.—Other African Areas: Production of mineral commodities—Continued

Country, commodity, and unit of measure[1]	1969	1970	1971 ^{p}
MALAGASY REPUBLIC[2]—Continued			
Mica, phlogopite:			
Block ... metric tons	62	39	34
Splittings ... do	1,006	878	443
Scrap ... do	114	19	111
Total ... do	1,182	936	588
Petroleum refinery products:			
Gasoline ... thousand 42-gallon barrels	727	859	967
Jet fuel ... do	94	478	443
Kerosine ... do	178	--	--
Distillate fuel oil ... do	731	1,136	1,078
Residual fuel oil ... do	^{e}1,553	1,393	1,337
Lubricants ... do	47	--	--
Liquefied petroleum gas ... do	30	98	96
Other ... do	39		
Refinery fuel and losses ... do	^{e}233	345	330
Total ... do	3,632	4,309	4,251
Quartz, piezoelectric ... kilograms	1,600	2,900	600
Rare-earth metals:			
Bastnaesite concentrate, gross weight ... metric tons	(4)	97	61
Betafite ore, gross weight ... kilograms	261	100	--
Euxenite ore, gross weight ... do	22	6	400
Monazite concentrate, gross weight ... metric tons	2	--	--
Salt, marine ... do	22,000	21,700	27,900
Stone:			
Calcite (industrial) ... do	NA	655	1,321
Quartz (metallurgical) ... do	98	75	92
Zirconium concentrate, gross weight ... kilograms	--	2,500	2,700
Other, mineralogical samples, not further described ... metric tons	--	--	22
MALAWI[2]			
Abrasives, natural, corundum ... do	NA	11	NA
Cement, hydraulic ... thousand metric tons	76	70	65
Kyanite ... metric tons	NA	1,371	NA
Lime ... do	NA	249	NA
Sodalite ... do	NA	2,386	NA
Stone, sand and gravel:			
Limestone ... do	NA	92,000	NA
Shale ... do	NA	90,000	NA
Other stone ... thousand cubic meters	NA	270	NA
Sand ... do	NA	170	NA
MALI[2]			
Gold, mine output, metal content ... troy ounces	32	^{e}30	^{e}30
Salt ^{e} ... metric tons	3,000	3,000	3,000
Stone:			
Limestone ... do	2,500	NA	NA
Marble ... do	2,500	NA	NA
MAURITANIA[2]			
Copper, mine output, metal content ... do	--	--	61
Iron ore and concentrate ... thousand metric tons	8,678	9,103	8,457
Rare-earth metals, monazite concentrate, gross weight ... metric tons	104	^{e}100	--
Salt, marine (including evaporated) ... do	900	^{e}1,000	^{e}1,000
MAURITIUS[2]			
Salt, marine ... do	4,064	4,000	^{e}4,000
NIGER			
Cement, hydraulic ... do	25,000	35,000	23,964
Gold, mine output, metal content ... troy ounces	161	235	119
Gypsum ^{e} ... metric tons	2,000	1,500	4,000
Salt ^{e} ... do	4,000	4,000	4,000
Sand ... do	2,000	NA	NA
Stone, limestone, not further described ... do	30,000	NA	NA
Tin, mine output, metal content ... long tons	^{r}34	66	67
Tungsten, mine output, metal content ... metric tons	--	1	^{e}1
Uranium concentrate, uranium content ... do	--	54	410
RWANDA[2]			
Beryllium, beryl ore and concentrate, gross weight ... do	^{r}294	286	194
Columbium and tantalum, ore and concentrate, gross weight ... do	22	NA	33
Tin, mine output, metal content ... long tons	1,323	1,320	^{e}1,300
Tungsten, mine output, metal content ... metric tons	170	181	^{e}200

See footnotes at end of table.

Table 1.—Other African Areas: Production of mineral commodities—Continued

Country, commodity, and unit of measure [1]	1969	1970	1971 [p]
SENEGAL [2]			
Cement, hydraulic ... metric tons	206,900	241,000	241,000
Clays, fuller's earth (attapulgite) ... do	3,940	3,050	2,810
Fertilizer materials, phosphatic:			
Crude:			
Aluminum phosphate ... thousand metric tons	164	130	147
Calcium phosphate ... do	1,035	998	1,398
Manufactured:			
Aluminum phosphate, dehydrated ... do	37	36	46
Other [5] ... do	3	7	2
Petroleum refinery products:			
Gasoline ... thousand 42-gallon barrels	806	634	669
Jet fuel and kerosine ... do	642	577	587
Distillate fuel oil ... do	925	906	834
Residual fuel oil ... do	1,754	1,478	1,522
Liquefied petroleum gas ... do	81	106	66
Refinery fuel and losses ... do	250	542	242
Total ... do	4,458	4,243	3,920
Salt [e] ... metric tons	79,900	117,749	123,000
Stone:			
Basalt ... cubic meters	30,000	15,635	25,100
Marble (cipoline) ... do	336	212	350
SOMALI REPUBLIC [2]			
Salt, marine [e] ... metric tons	2,000	2,000	2,000
SOUTHERN RHODESIA [6]			
Abrasives, natural, corundum [e] ... do	1,800	1,800	1,800
Asbestos [e] ... do	80,000	80,000	80,000
Beryllium, beryl concentrate, gross weight [e] ... do	90	90	90
Cement, hydraulic ... thousand metric tons	382	474	[e] 500
Chromium, chromite, gross weight [e] ... metric tons	[r] 360,000	[r] 360,000	360,000
Coal, bituminous ... thousand metric tons	3,332	[e] 3,400	[e] 3,400
Coke, metallurgical ... do	243	[e] 245	[e] 245
Columbium-tantalum minerals, tantalite, gross weight [e] ... metric tons	45	45	40
Copper:			
Mine output, metal content [7] ... do	24,843	26,527	29,337
Smelter ... do	21,148	20,711	27,002
Fertilizer materials, crude, phosphate rock [e] ... do	11,000	11,000	11,000
Fluorspar [e] ... do	150	150	150
Gold, mine output, metal content [e] ... troy ounces	480,000	500,000	500,000
Iron and steel:			
Iron ore [e] ... thousand metric tons	500	500	500
Pig iron and ferroalloys [e] ... do	270	280	280
Crude steel [e] ... do	[r] 140	[r] 150	150
Lithium minerals, gross weight [e] [8] ... metric tons	61,000	61,000	61,000
Magnesite ... do	18,000	18,000	20,000
Nickel, mine output, metal content [e] ... do	4,000	11,000	11,600
Pyrite:			
Gross weight [e] ... do	72,000	73,000	73,000
Sulfur content [e] ... do	29,000	30,000	30,000
Silver mine output, metal content [9] ... thousand troy ounces	[e] 70	71	[e] 71
Stone, industrial limestone [e] ... thousand metric tons	640	640	650
Tin:			
Mine output, metal content [e] ... long tons	600	600	600
Smelter [e] ... do	600	600	600
SUDAN [2]			
Cement, hydraulic ... metric tons	[r] 169,000	156,000	169,112
Chromium, chromite concentrate, gross weight ... do	[r] 25,444	47,060	22,762
Gypsum and anhydrite, crude ... do	[e] 5,000	1,637	[e] 2,000
Iron ore, gross weight (exports) ... do	8,748	31,110	4,100
Magnesite, crude ... do	499	100	[e] 100
Manganese ore and concentrate, gross weight ... do	853	1,160	[e] 1,200
Mica ... do	--	--	97
Petroleum refinery products:			
Gasoline ... thousand 42-gallon barrels	747	767	810
Jet fuel ... do	465	491	667
Kerosine ... do	151	158	133
Distillate fuel oil ... do	1,786	1,746	2,036
Residual fuel oil ... do	1,803	1,593	1,268
Other ... do	26	1,178	1,822
Refinery fuel and losses ... do	619	281	331
Total ... do	5,597	6,214	7,067
Salt ... metric tons	50,847	52,366	57,663

See footnotes at end of table.

Table 1.—Other African Areas: Production of mineral commodities—Continued

Country, commodity, and unit of measure [1]	1969	1970	1971 [p]
SWAZILAND [2]			
Asbestos, chrysotile metrlc tons	39,079	33,057	35,484
Barite do	571	338	144
Clays, kaolin do	1,657	1,620	2,049
Coal, bituminous do	104,232	122,946	148,347
Iron ore, direct shipping, gross weight thousand metric tons	2,302	2,296	2,886
Stone, quarry product thousand cubic meters	40,240	32,678	25,051
Talc (pyrophyllite) metric tons	599	254	204
Tin, mine output, metal content [e] long tons	12	12	12
TOGO [2]			
Cement (ground from imported clinker) metric tons	--	--	49,123
Clays, for brick production do	NA	NA	[e] 3,000
Fertilizer materials, phosphate rock:			
Run-of-mine thousand metric tons	2,968	[e] 3,040	[e] 3,430
Beneficiated product do	1,473	1,508	1,715
Stone, marble metric tons	[e] 2,500	3,801	[e] 3,000

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the countries listed individually in this table, Dahomey, Equatorial Guinea, the French Territory of the Afars and Issas, Gambia, Spanish Sahara and Upper Volta, all covered textually in this chapter, presumably produce modest quantities of crude construction materials such as clays, stone, sand and gravel, and may produce minor amounts of other mineral commodities (most notably gypsum, lime and salt) but no production data are reported, and available information is inadequate to make reliable estimates of output levels.

[2] In addition to the commodities listed, a variety of crude construction materials may be assumed to have been produced, but no production data are reported, and available information is inadequate to make reliable estimates of output levels.

[3] In addition to the commodities listed, tungsten minerals, columbium-tantalum minerals, and a variety of crude construction materials all may be assumed to have been produced, but no production data are reported, and available information is inadequate to make reliable estimates of output levels.

[4] Less than ½ unit.

[5] Products marketed under the trade names "baylifos" and "phosphal."

[6] In addition to the commodities listed, graphite, mica, tungsten minerals, and a variety of crude construction materials have been produced, but no recent data on output are available and general information is inadequate to make reliable estimates of output levels.

[7] Output of Umkondo, Alaska, Lomagundi, Mangula, Gwai River, Inyati and Muriel mines; data are for year ended September 30 of that stated.

[8] Figures presented are 1964 total recorded production rounded. Eycryptite, lepidolite, petalite and spodumene, all of which were produced in 1964. No reliable basis is available for estimation of individual output levels for these minerals, nor for estimating year-to-year variations in output for 1965–71.

[9] Inyati mine only.

15-percent share participation in the diamond mining venture. Government revenue from royalties on diamond sales, taxes on profits, and company dividends will be about $8 million per year by 1975.

Reportedly, a feasibility study proved sufficient reserves in the brine of the Makgadikgadi Pan for minimum production of 80,000 tons of soda ash and 100,000 tons of salt.[5] Makgadikgadi Soda Ltd., a subsidiary of Roan Consolidated Mines, obtained a 2-year concession on the deposit and constructed a pilot plant at Shashi for recovering soda ash and salt. The plant began operating in March. Makgadikgadi Soda plans to construct a pipeline and a refinery at Shashi if results of the pilot plant are encouraging.

BURUNDI [6]

The mineral industry of the Republic of Burundi consisted mainly of the mining of bastnaesite, a rare-earth mineral, and cassiterite, an ore of tin. Small quantities of gold, lime, and miscellaneous construction materials (clays, sand and gravel) were also produced. The industry was of minor significance to the country's gross national product (GNP), which was estimated at $204.7 million.[7] Export earnings from minerals comprised between 1 and 2 percent of total exports of $21.4 million,[8] a small decrease from the previous year. Exports consisted mainly of gem diamond and tin ore and concentrates. Petroleum refinery products provide the bulk of mineral commodity imports, which arrive in landlocked Burundi by rail through Tan-

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[5] Mining & Minerals Engineering. Screenings. V. 7, No. 9, September 1971, p. 36.

[6] James S. Kennedy, industry economist, Division of Nonferrous Metals.

[7] Where necessary, values have been converted from Burundi Francs (RBF) to U.S. dollars at a rate of RBF 87.5=US$1.00.

[8] U.S. Embassy, Bujumbura. Economic Trends Report. State Department Airgram A-43. Apr. 10, 1972, 10 pp.

Table 2.—Burundi: Apparent foreign trade in selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1969	1970
EXPORTS		
Copper, metal, refined	--	259
Diamond, gem ..... value, thousands	$1,693	NA
Tin ore and concentrate ..... long tons	94	18
Tungsten ore and concentrate	10	6
Unspecified crude nonmetals	150	303
IMPORTS		
Iron and steel semimanufactures	1,930	4,438
Petroleum refinery products, lubricants	NA	165

NA Not available.

[1] Compiled from trade returns of 24 trading partner countries given in Statistical Office of the United Nations, 1969 and 1970 editions of the Supplement to the World Trade Annual. V. 3 (Africa), published by Walker and Co., New York, 1971 and 1972.

zania to Kigoma, a port on Lake Tanganyika, and then by boat to Bujumbura. Exploration, consisting primarily of a mineral survey, financed by the United Nations Development Fund (UNDF), continued with negative results although traces of several minerals have been found since initiation of the program in 1969.

Production of bastnaesite concentrate by Société Minérale de Karonge (SOMIKA), a Belgian firm, continued at a reduced level as a result of weak world prices and declining ore grade. SOMIKA planned to reopen a tungsten mine at Kungama, near its Mulehe operations, by midyear. Feasibility studies continued on reopening a columbium-tantalum mine in the same region.

In August the first phase of the $1 million, 3-year United Nations Development Program (UNDP) mineral survey was completed, behind schedule. Delays in completing the program resulted from the shortage of technical personnel and difficulties encountered in equipment deliveries. Results of the survey to date have been discouraging despite indications of copper, gold, bismuth, molybdenum, and uranium. Expenditures in 1971 totaled $373,500. At yearend surveys were continuing on contingency financing, pending approval of a second phase requested by the Government.

Field work began in October on development of the Karega River basin in conjunction with Rwanda and Tanzania. Planning for the project was subcontracted to the consortium of Carlo Lotti/Hydroproject for completion in 1972.[9]

ELC Electroconsult, Milan, Italy, completed UNDP-financed feasibility studies on establishment of a hydroelectric power station near Bujumbura. Plans for a 3,000- to 6,000-kilowatt plant capacity have been made.

CAMEROON[10]

Aluminum and cement were the principal mineral products of the Federal Republic of Cameroon in 1971. Small quantities of cassiterite (tin ore) and gold were also produced.

All of the aluminum was produced by Compagnie Camerounaise de l'Aluminium Péchiney-Ugine (Alucam) at its plant at Edea. This plant, which was one of only three primary aluminum plants in Africa, produced metal from alumina imported from Guinea.

Economic and technical studies of the bauxite deposits near Minim Martap in the Adamawa Range were continued by Société d'Études des Bauxites du Cameroun (SEBACAM), an association formed by the Government (40 percent) and three European aluminum companies (60 percent). Estimates of bauxite reserves in the Minim Martap area have been on the order of 1 billion tons. The deposits are near a section of the Trans-Cameroon Railway scheduled for completion by 1975. The studies, which were to be completed by 1974, will report on the feasibility of a large-scale bauxite exporting enterprise and the possibility of producing alumina. A report on the possible development of deep-water port facilities for shipping the bauxite or alumina has been completed.

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[9] Jaeger, Alfred L. (resident representative of the UNDP). Annual Report for 1971 on Development Assistance. Mar. 15, 1972, 103 pp.

[10] Horace F. Kurtz, industry economist, Division of Nonferrous Metals.

Cimenteries du Cameroon (CIMENCAM) put two cement plants into operation during 1971. In January, production began at the Bonaberi clinker crushing plant near Douala. This plant with a rated annual capacity of 120,000 tons was expected to serve southern, central, and western Cameroon. In December, a cement plant at Figuil with a capacity of 25,000 tons began production to supply northern Cameroon and Chad. Expansion of both plants was being studied.

No worthwhile oil finds resulting from exploration on the coastal concessions were reported during the year.

Table 3.—Cameroon: Apparent foreign trade in selected mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1969	1970
EXPORTS		
METALS		
Aluminum metal:		
Unwrought	45,201	38,590
Semimanufactures	360	NA
Copper and copper alloys, scrap	146	36
Iron and steel scrap	1,131	3,418
Tin ore and concentrate ... long tons	40	35
Metal scrap, n.e.s	48	NA
IMPORTS		
METALS		
Aluminum, metal and alloys, unwrought and semimanufactures	186	1,257
Copper, metal and alloys, unwrought and semimanufactures	49	131
Iron and steel:		
Pig iron and ferroalloys	285	NA
Steel, primary forms	559	690
Semimanufactures	36,851	73,296
Lead, metal and alloys, unwrought and semimanufactures ... value, thousands	$28	$25
Magnesium, metal and alloys, unwrought and semimanufactures	130	110
Other:		
Oxides of titanium, lead, zinc, and other metals for paint	89	149
Metals and alloys, not reported separately	60	NA
NONMETALS		
Barite and witherite	10,370	2,000
Cement, hydraulic	79,405	135,729
Clays and products:		
Crude, n.e.s	1,364	1,000
Products:		
Nonrefractory	1,217	1,434
Refractory	1,754	1,797
Cryolite and chiolite, natural	[2] 1,473	757
Diatomite and other infusorial earths	225	269
Fertilizer materials manufactured:		
Nitrogenous	28,937	21,037
Potassic	5,910	6,490
Mixed	12,296	8,431
Lime	684	1,180
Salt	12,880	1,618
MINERAL FUELS AND RELATED MATERIALS		
Petroleum refinery products: [3]		
Gasoline:		
Aviation ... thousand 42-gallon barrels	80	82
Other ... do	656	662
Jet fuel ... do	390	394
Kerosine ... do	44	45
Distillate fuel oil ... do	516	521
Residual fuel oil ... do	171	175
Lubricants ... do	49	50
Other ... do	68	69
Total ... do	1,974	1,998
Tar, pitch, and other crude chemicals from coal, oil, or gas distillation	564	NA

NA Not available.

[1] Except as noted, compiled from trade returns of 24 trading partner countries given in Statistical Office of the United Nations, 1969 and 1970 editions of Supplement to the World Trade Annual. V. 3 (Africa), published by Walker and Company, New York, 1971 and 1972.

[2] Excludes unspecified tonnages from Denmark, which assuming a unit value equal to that of the reported tonnages from other countries, would total 766 tons in 1969.

[3] Source: Bureau of Mines International Petroleum Annual 1969 and 1970 editions.

CENTRAL AFRICAN REPUBLIC [11]

Diamond mining, the Central African Republic's only mineral industry, continued to suffer from a protracted dispute between private mining companies and the Government. Company operations remained closed during the year, and native diggers accounted for all diamond production. As a result, both quantity and value declined, and the country's perennial trade deficit was magnified. However, the year ended on a brighter note as negotiations then under way led to an agreement early in 1972 and the likely resumption of organized mining later in the year or in 1973.

New mineral-related projects in the planning or discussion stages included cement clinker crushing and fertilizer plants, a glassworks, and investigation of a copper deposit. The project to open a uranium mine was cancelled.

PRODUCTION AND TRADE

Continued absence of the diamond mining and buying companies from the country drove diamond production and value down again in 1971. Production, accounted for entirely by individual diggers, totaled 437,449 carats, a decline of 9 percent from the 1970 level and 28 percent below the recent peak output of 609,360 carats obtained in 1968. A higher average price caused a decline in the total value of 8 percent, to $11.6 million from $12.6 million in 1970.

The only other known mineral production in the country was an unrecorded quantity of building materials which was consumed entirely in local construction use.

Statistics on mineral production for the years 1969–71 are included in table 1.

Foreign trade statistics for 1970, the latest figures available, show the effect of lower diamond output in that year on mineral commodity trade. Exports of diamond decreased 23 percent in value, to $12.3 million from $16.0 million in 1969. Other mineral exports—consisting mainly of semimanufactured metals, fertilizer materials, and reexported petroleum products—added only about $100,000 to the total export value in each year so that the $3.9 million decrease in the mineral trade balance was caused solely by lower diamond exports and a slight rise in imports.

The following tabulation gives values of total trade and of mineral trade for the last 3 available years in million dollars.

	1968	1969	1970
Total commodity trade:			
Exports	36.0	38.2	32.7
Imports	40.1	44.4	41.1
Balance	−4.1	−6.2	−8.4
Mineral commodity trade:			
Exports	19.0	16.1	12.4
Imports	2.6	[r]4.4	4.6
Balance	16.4	[r]11.7	7.8

[r] Revised.

Exports and imports of selected mineral commodities in 1969 and 1970 are shown in table 4.

COMMODITY REVIEW

Diamond.—The dispute between the Government and private mining companies, principally subsidiaries of Diamond Distributors, Inc., of New York, kept the companies' operations shut down throughout 1971. All diamond production during the year was the result of work by individual diggers. Negotiations between the Government and the companies continued through the year and resulted in a new agreement that was signed early in 1972. Full-scale mining probably will not resume until late in 1972 or early in 1973.[12]

Uranium.—Development of a uranium mine at Bakouma by Compagnie des Mines d'Uranium de Bakouma was terminated. Cancellation of the project deprived the economy and the Government of a badly needed potential source of income.[13]

Other Minerals.—International assistance was requested for a project to build a cement clinker grinding plant in the Central African Republic.[14] Other small industrial developments under consideration included a fertilizer plant and a glassworks.[15] A Romanian geological team was studying samples of a copper deposit in the northeastern part of the country, which, however, had been previously examined and declared uneconomic by French researchers.[16]

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[11] David G. Willard, economist, Division of Nonmetallic Minerals.

[12] U.S. Department of State, Washington, D.C. Telegram 219153, December 1971, 1 p.

[13] U.S. Embassy, Bangui, Central African Republic. State Department Airgram A–42, Mar. 14, 1972, p. 5.

[14] U.S. Embassy, Vienna, Austria. State Department Airgram A–705, Sept. 25, 1971, encl., p. 4.

[15] Work cited in footnote 12.

[16] U.S. Embassy, Bangui, Central African Republic. State Department Airgram A–76, May 8, 1971, 1 p. and encl.

Table 4.—Central African Republic: Foreign trade in selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
EXPORTS		
METALS		
Copper matte	--	7
Iron and steel semimanufactures	46	21
NONMETALS		
Clay products, nonrefractory	2	NA
Diamond, gem and industrial value, thousands	$15,974	$12,270
Fertilizer materials, crude and manufactured:		
Nitrogenous	672	89
Phosphatic	96	28
Potassic	41	18
Ammonia value, thousands	$1	$1
Salt	73	NA
MINERAL FUELS AND RELATED MATERIALS		
Petroleum refinery products:		
Gasoline thousand 42-gallon barrels	2	2
Liquefied petroleum gas do	(1)	(1)
Lubricants do	1	(1)
IMPORTS		
METALS		
Aluminum and alloys, semimanufactures	17	17
Copper and alloys, semimanufactures	4	12
Iron and steel:		
Pig iron and ferroalloys	2	NA
Semimanufactures	3,588	4,322
Lead:		
Oxide	5	3
Metal including alloys, semimanufactures	4	1
Tin and alloys, semimanufactures long tons	1	NA
Titanium oxide	3	3
Zinc:		
Oxide	2	2
Metal including alloys, semimanufactures	14	NA
Nonferrous metal ores and concentrates n.e.s value, thousands	$1	$2
NONMETALS		
Abrasives:		
Natural, powder of precious and semiprecious stones value, thousands	$5	$5
Grindstones	2	3
Barite and witherite	49	48
Cement, hydraulic	2,962	158
Chalk	28	51
Clay products:		
Refractory	3	4
Nonrefractory	87	254
Dolomite	60	42
Fertilizer materials:		
Manufactured:		
Nitrogenous	954	1,242
Phosphatic	228	453
Potassic	564	1,342
Mixed	1,245	719
Ammonia	3	5
Gypsum	1	1
Lime	110	111
Salt	4,732	4,251
Sand and gravel	30	14
Sodium and potassium compounds n.e.s	520	432
Stone, dimension	1	NA
Talc and related materials	19	20
Nonmetallic minerals, crude n.e.s	387	305
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	30	NA
Petroleum refinery products:		
Gasoline thousand 42-gallon barrels	36	16
Kerosine do	8	1
Distillate fuel oil do	19	NA
Residual fuel oil do	(1)	NA
Lubricants do	6	7
Liquefied petroleum gas do	1	(1)
Other products n.e.s do	2	9

NA Not available.

[1] Less than ½ unit.

CHAD [17]

Sun-dried natron (hydrous sodium carbonate) was the only reported mineral produced and exported by Chad. The mineral was mined along the shore of Lake Chad. Reported uses of natron include usage in cattle feeds, medicines, soap, seasoning, tobacco flavoring, and tanning. In addition to natron, unspecified quantities of salt and construction materials are produced for domestic use. Salt was said to have been mined in the province of Borkou-Ennedi-Tibesti and some of it was said to have been marketed in Libya and Sudan.

Only a few thousand tons of natron are produced annually as shown in table 1.

Chad's exports of mineral commodities are negligible as shown in table 5.

Chad is almost entirely dependent on imports for its requirements of mineral commodities and all of the imports are

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[17] Donald E. Eilertsen, physical scientist, Division of Nonmetallic Minerals.

Table 5.—Chad: Foreign trade in selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
EXPORTS		
METALS		
Iron and steel scrap	25	NA
NONMETALS		
Abrasives, natural ..... value, thousands	$1	NA
Clay products, nonrefractory	60	NA
Nonmetallic minerals, crude n.e.s	2,994	NA
MINERAL FUELS AND RELATED MATERIALS		
Petroleum refinery products, lubricants ..... 42-gallon barrels	35	NA
IMPORTS		
METALS		
Aluminum and alloys semimanufactures	155	142
Copper and alloys semimanufactures	10	--
Iron and steel:		
Pig iron and ferroalloys	3	--
Semimanufactures	3,734	5,568
Lead and alloys semimanufactures	9	--
Tin and alloys semimanufactures ..... long tons	2	--
Nonferrous metal ores and concentrates, n.e.s	90	--
NONMETALS		
Abrasives:		
Natural	9	--
Grindstones	24	--
Cement, hydraulic	12,703	13,751
Clay products:		
Refractory	3	--
Nonrefractory	187	116
Diatomite	1	--
Fertilizer materials:		
Manufactured:		
Nitrogenous	23	16
Phosphatic	16	--
Potassic	449	875
Ammonia	2	--
Lime, ordinary and hydraulic	176	--
Salt	3,178	3,946
Sand and gravel	3	--
Sodium and potassium compounds n.e.s	369	--
Stone, dimension	6	--
Talc and related materials	1	--
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	6	5
Petroleum refinery products:		
Gasoline ..... thousand 42-gallon barrels	179	198
Kerosine ..... do	116	148
Distillate fuel oil ..... do	154	136
Liquefied petroleum gas ..... do	3	--
Lubricants ..... do	12	14
Residual fuel oil ..... do	28	--
Other products n.e.s ..... do	20	35

NA Not available.

small. Iron and steel semimanufactures, cement, and salt have been the only commodities which exceed 1,000 tons per year.

Chad has numerous mineral deposits which need to be studied to determine their commercial usefulness. Kaolins, gold, rare-earth minerals, and uranium occur in the province of Guera; diatomites in Kanem; gold in Quaddai, and bauxite and iron in the territory nearest the coast. Chad also has other natron deposits along the northeastern shore of Lake Chad which could be worked.

A permit issued to explore the Erdis area of 58,687 square miles near the border of Libya and Sudan for oil and other minerals was reassigned to Ste. Indépendante de Recherches et d'Exploitation Pétrolières (SIREP) in September 1970. Continental Oil Co. did some magnetometer and photogeologic surveys over their Lake Chad and Chari leases of land, but no exploration drilling was done.[18]

CONGO (BRAZZAVILLE) [19]

The value of Congo's mine production in 1971 was 2.08 billion CFA francs, equivalent to $7.5 million.[20] This was nearly triple the value of the 1970 production and was the first time the value exceeded 1 billion CFA francs.

Soviet mining exploration missions continued prospecting in the Niari administrative division for copper, lead, and zinc and it was reported that a discovery was made of these nonferrous metals at Mt. Mfouati, 250 kilometers west of Brazzaville. No details on estimated reserves were reported, but development of the mine is scheduled to begin in 1972. The production of nonferrous ores of the Société Minière de M'Passa was halted between March 1969 and November 1970 to allow the installation of a processing plant with a capacity of 400 tons of ore per day. The method of concentration will be by flotation which is more efficient than the gravimetric washing used formerly for richer ores. The halt in production was reflected in the lower output of lead and zinc in 1970 and copper in 1969 and 1970, but in 1971, production of nonferrous ores returned to the same level as it was prior to the modernization of the processing plant.

An integrated foundry rolling mill is planned in Pointe Noire for the Congolese, Central African Republic, and Gabonese markets. The plant's capacity would be 10,000 tons annually for the foundry and 20,000 tons for the rolling mill. The raw

Table 6.—Republic of Congo (Brazzaville): Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum and alloys scrap	52	55
Copper:		
Ore and concentrate	579	--
Matte	83	19
Iron and steel:		
Scrap	1,217	1,049
Semimanufactures	148	101
Zinc ore and concentrates	5	--
NONMETALS		
Cement, hydraulic	31	--
Diamond, gem ... value, thousands	$6,515	$2,905
Fertilizer materials, crude potassic	44,713	137,534
MINERAL FUELS AND RELATED MATERIALS		
Petroleum:		
Crude ... thousand 42-gallon barrels	238	128
Refinery products:		
Gasoline ... do	3	3
Kerosine and jet fuel ... do	18	24
Lubricants ... do	(1)	(1)

(1) Less than ½ unit.

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[18] Am. Assoc. Petrol. Geol. Bull. Chad. V. 55, No. 9, September 1971, pp. 1568–69.

[19] Herbert R. Babitzke, chemist, Division of Nonferrous Metals.

[20] Where necessary, values have been converted from Communauté Financière Africaine Francs (CFAF) to U.S. dollars at the rate of CFAF278=US$1.00.

Table 7.—Republic of Congo (Brazzaville): Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum:		
Oxide	--	40
Metal and alloys, all forms	72	78
Copper:		
Matte, speiss and similar materials	9	9
Metal and alloys unwrought and semimanufactures	35	59
Iron and steel:		
Pig iron ferroalloys and crude steel	154	--
Semimanufactures	16,199	13,440
Lead:		
Oxide	20	10
Metal and alloys, all forms	21	11
Silver, unworked and partly worked value, thousands	$4	--
Tin metal and alloys, all forms long tons	2	2
Titanium oxide	28	18
Zinc:		
Oxide	--	8
Metal and alloys, all forms	6	4
Other, alkali, alkaline earth and rare-earth metals	15	--
NONMETALS		
Barite	10	46
Boron materials:		
Boric oxide and acid	26	12
Cement, hydraulic	1,760	1,734
Chalk	49	114
Clays and products:		
Clays, crude	41	299
Products:		
Nonrefractory	349	291
Refractory	179	11
Diatomaceous earth	40	19
Fertilizer materials:		
Natural, crude, potassic	24	6
Manufactured:		
Nitrogenous	4,138	25
Phosphatic	86	20
Potassic	3,953	1,235
Mixed	56	--
Ammonia	14	6
Gypsum	1,992	2,154
Lime	763	461
Magnesite, crude	92	--
Pigments, mineral:		
Natural n.e.s	8	6
Iron oxides manufactured	--	8
Salt	2,116	2,513
Sodium and potassium hydroxides and peroxides	751	706
Stone, sand and gravel:		
Dolomite	20	54
Crushed and broken stone and gravel n.e.s	15	--
Sand	59	--
Talc and related materials	49	66
MINERAL FUELS AND RELATED MATERIALS		
Asphalt, natural	11	24
Coal	76	33
Coke	45	50
Petroleum refinery products:		
Gasoline thousand 42-gallon barrels	28	15
Kerosine and jet fuel do	19	12
Distillate fuel oil do	267	86
Lubricants do	51	35
Other do	12	11
Total do	377	159
Crude chemicals from distillation of coal, oil or petroleum	8	--

materials would come from recovery of scrap iron and from imports.

Potassium chloride production by the Compagnie des Potasses du Congo began in May 1969 in a plant with an annual capacity of 840,000 tons potassium chloride. The volume of extracted crude salt increased from 206,267 tons in 1970 to 430,151 tons in 1971.

Oil production from the Pointe Indienne deposit of the Société Elf des Pétroles d'Afrique Equatoriale (Elf-SPAFE) has declined steadily from 1962 to 1971 because of the depletion of the field. Elf-Congo and Azienda Generale Petroli Italiani (AGIP) have encountered high-pressure gas on AGIP's 3,500-square-kilometer offshore concession 20 kilometers from Pointe Noire. Elf-Congo's new Emeraude offshore field went into production in December at an initial rate of nearly 4 million barrels per year and is expected to exceed 10 million barrels per year by 1974. The Emeraude deposit was estimated at 750 million barrels of crude oil which represents a small part of the aggregate reserves.

The Government has decided to build an oil refinery at Pointe Noire. The new refinery will be built under a contract signed in the final days of 1971 between the People's Republic of the Congo and the Belgian-owned Sibetra Corp. The plant will cover an area of 300,000 square meters and will employ 150 to 200 specialists. When completed the refinery will be able to process a million tons of crude oil per year, and its output will cover all domestic fuel requirements with a large surplus for export.

DAHOMEY [21]

The mineral industry of Dahomey contributed little to the value of the economy of the country as represented by the gross national product (GNP) estimated at $233 million in 1971. Activity in the minerals sector consisted mainly of exploration for crude oil in offshore waters and the production for local consumption of salt, stone, and sand and gravel. Cement was manufactured from imported clinker in a plant constructed near Cotonou in 1970. The Government of Dahomey and the United Nations Special Fund conducted geological and mineral surveys in the northern section of the country. A survey of underground waters being conducted by an agency of the United Nations was completed in 1971. The Government also was conducting preliminary studies to determine whether the construction of a petroleum refinery in Dahomey was economically feasible. A new investment code was enacted by the Government, which guaranteed to all private enterprises certain exemptions, equitable compensation in case of expropriation, nondiscriminatory treatment of foreign and domestic capital, and repatriation of profits. The Government with the help of the United Nations Development Program (UNDP) was drafting a new mining code. The new code was expected to be issued by yearend.

Reportedly the Perma gold mine in the Natitingou region was being studied for possible exploitation because of newly discovered alluvial deposits containing 0.354 ounce per 35 cubic feet of sediments and quartz veins embedded in green rock containing up to 0.643 ounce per 35 cubic feet of quartz.[22] An iron ore deposit located in the northern border region was estimated to contain 250 million tons of ore with an iron content of 50 percent. The deposit is not economically exploitable because of its long distance from an ocean port. The Atomic Energy Commission of France was prospecting in the northeastern section of Dahomey for uranium deposits. Reportedly results were not encouraging.

Société des Ciments du Dahomey (SCD), located at Cotonou, produced 86,588 tons of cement during 10 months of 1971. About 2,601 tons were exported and the remaining quantity was consumed in Dahomey. The Onigbolo cement plant project, which was begun in 1970, was continued in 1971, under the Government's 2-year interim development plan (1971–72). This project consists of constructing a plant with an initial production capacity of 300,000 tons per year of cement to provide for domestic consumption of 100,000 tons and allow for exports to neighboring countries. Raw material for cement manufacture would be obtained from the two limestone deposits located at Onigbolo and Masse, in the Pobe region. Proven reserves of these deposits total 37 million tons of limestone with a calcium carbonate ($CaCO_3$) content of from 75 to 95 percent. The railroad from Cotonou would have to be extended from Pobe to Onigbolo, a distance of 14 miles. In order to export 200,000 tons of cement to Nigeria, this railroad would have to be extended another 5 miles from Onigbolo to link up with the Nigerian Railway.

Another project under study was the establishment of a marble factory to be supplied by a 5-million-ton deposit of gray and white marble located at Dadja. The production of marble blocks and tiles will be mainly for export. In July the cornerstone was laid for a factory capable of producing 20,000 tons of bricks per year and 326 tons of dishes per year. The factory will employ 200 persons. A ceramics plant with a capacity of 3,746 tons of mosaic and enameled tiles per year also will be constructed. This plant will employ 132 persons. Both units of the complex were expected to be operating in 1972. Cost of the ceramic complex was about $5 million. Reportedly traces of phosphate, gypsum, lignite, and diamond have been discovered in the central and northern regions and were being investigated by Government and the UNDP.

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[21] Henry E. Stipp, physical scientist, Division of Ferrous Metals.

[22] Industries et Travaux D'Outremer. Dahomey. No. 219, February 1972, pp. 109–115.

Table 8.—Dahomey: Apparent trade in mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1969	1970
EXPORTS		
Diamond, industrial ... value, thousands	$1,045	$97
Iron and steel scrap	906	769
IMPORTS		
Aluminum and alloys, semimanufactures	73	NA
Cement, hydraulic	28,630	44,398
Clay products, nonrefractory	746	623
Copper and alloys, semimanufactures	20	22
Fertilizer materials manufactured:		
Potassic	4,652	3,413
Mixed	1,444	NA
Iron and steel semimanufactures	9,590	9,344
Petroleum refinery products:		
Gasoline ... thousand 42-gallon barrels	41	28
Kerosine and jet fuel ... do	84	89
Distillate fuel oils ... do	38	85
Lubricants ... do	9	6
Salt	932	832
Sodium compounds n.e.s., caustic soda	369	561
Other:		
Crude nonmetals, n.e.s	887	--
Nonferrous metals unwrought and semimanufactures ... value, thousands	$21	$10

NA Not available.

[1] Compiled from trade data of selected trading partner countries.

Source: Statistical Office of the United Nations, 1969 and 1970 editions of Supplement to the World Trade Annual. V. 3 (Africa), published by Walker and Co., New York, 1971 and 1972.

A concession agreement between Dahomey Shell for Research and Development (SHELL-DAHOREX) and the Dahomey Government, granting subsoil rights on 12,000 square kilometers of land on shore and under territorial waters to limits of Continental Shelf, was signed on May 12, 1971. The company planned to spend $12.4 million in a 3-year period, starting with seismic survey offshore in 1972. Pividoy International Corp. of Los Angeles signed a concession agreement with the Government in October. The agreement covered 23.9 percent of Union Oil Co.'s original concession and called for study, exploration, and possible production of petroleum or gas.

EQUATORIAL GUINEA AND FERNANDO PO[23]

Mineral industry activity in Equatorial Guinea and Fernando Po consisted mainly of the exploration for crude petroleum in offshore territorial waters. Small quantities of stone, and sand and gravel probably were produced for local use.

In June the Government approved the total renunciation of concessions, mainly in the Fernando Po area, held by Spanish Gulf Oil Co. and its partners,—Rio Tinto Mines Co. and the Bank of Bilbao. Continental Oil Co. of Equatorial Guinea (CONOCO), acting on behalf of its partners, Spanish Gulf Oil Co. and Compañia Española de Petroleos S.A. (CEPSA), also renounced rights to its concession area offshore and onshore Rio Muni. CONOCO apparently decided to withdraw from the area because of a border dispute between Equatorial Guinea and Gabon that interfered with the company's drilling obligations.

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[23] Henry E. Stipp, physical scientist, Division of Ferrous Metals.

In July, Chevron Oil Co. stopped drilling and plugged its well offshore Fernando Po. The company planned to conduct geophysical exploration offshore Rio Muni to locate a site for drilling the next hole.

ETHIOPIA [24]

The mineral industry of Ethiopia continued to be of minor importance to the economy of the country as represented by the gross national product estimated at $2,034 million [25] in 1971 (current prices). However, present plans to develop copper deposits near Debarwa and Adi Nefas could contribute significant amounts to government revenue, increase employment, and provide increased foreign exchange reserves.

The Ethiopian Government was considering a United Nations Development Program (UNDP) proposal to strengthen the country's geological survey activities by providing specialists for exploration of mineral resources. According to the Ethiopian Ministry of Mines, interesting anomalies were obtained from the aeromagnetic survey conducted in an area south of Asmara by United Kingdom Government teams. Nippon Mining Co. of Japan and the Ethiopian Government agreed to an amendment of Nippon's concession agreement that would increase the company's prospecting and mining area near Asmara from 1,081 square miles to about 3,474 square miles.

The UNDP completed a preliminary survey that revealed three areas where potential sources of geothermal power occur. These areas are in the Tendaho depression northeast of Addis Ababa, the Danakil depression, northeastern Ethiopia, and the Rift Valley lakes district, southern Ethiopia. Shallow drilling and cost-benefit studies were planned by the UNDP. United States Agency for International Development (USAID) and other foreign government agencies furnished specialists for various mineral surveys in 1971. Although a new investment code was under review by the Ministry of Commerce, Industry and Tourism, it was not known when the code would be forwarded for consideration by the Ethiopian Parliament.

Production of mineral commodities in 1971 consisted mainly of petroleum refinery products, cement, gold, salt, and platinum as shown in table 1. Statistics on trade are shown in tables 9 and 10.

Nippon Mining Co. of Japan conducted geophysical and drilling surveys of several sites in its concession area near Asmara, northern Ethiopia.[26] The company located a deposit of copper, lead, and zinc ore at Adi Nefas, 7 miles north of Asmara that was estimated to be from 1.5 million to 2.4 million tons of ore containing an average 3 to 4 percent copper and smaller quantities of lead and zinc. Another deposit of copper, lead, and zinc ore was located at Debarwa, 25 miles south-southwest of Asmara. An incomplete drilling program indicated three ore veins estimated to contain about 1 million tons of ore averaging 5 percent copper content. Probable reserves at the two locations were estimated at 3 million tons of ore averaging between 4 and 5 percent copper. The company planned to construct a concentrating plant at Debarwa capable of producing 8,000 tons per month of copper concentrates containing about 14 percent copper. Much smaller quantities of lead and zinc concentrates also will be produced. The copper contains about 0.32 troy ounce of gold per ton and the lead and zinc contains traces of silver and cadmium.

Reportedly, an Italian prospector has located deposits of asbestos, mica, and phosphates in Harar Province, southeastern Ethiopia.[27] Reserves of asbestos were estimated at 1 million tons, mica reserves at 100,000 tons, and phosphate reserves at about 1.5 million tons. The asbestos was being mined by 100 workers, and plans were made to mine the mica and phosphates. Other minerals such as nickel, cobalt, bauxite, and limestone also were said to occur in the area.

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[24] Henry E. Stipp, physical scientist, Division of Ferrous Metals.

[25] Where necessary, values have been converted at the rate of Ethiopian$1 = US$0.44.

[26] U.S. Embassy, Addis Ababa. State Department Airgram A-10, Apr. 13, 1972, p. 5, encl. 3.

[27] Marchés Tropicaux et Mediterranéens (Paris). Ore Deposits in East Now Being Exploited. Jan. 21, 1972, p. 225.

International interest in the potash reserves of the Danakil Depression, Eritrea Province, has been limited, owing to a world oversupply and low prices for potash. However, an economic reevaluation of the deposits, based upon the possibility of developing new markets in Pakistan, India, and Ceylon, was in progress with assistance from foreign sources.

Geophysical exploration work was carried out for Ethiopian Oil Corp. (EOC) in its concession area in the Red Sea opposite Massawa. Reportedly, EOC entered into a cooperative arrangement with Signal Oil and Gas Co., Sun Oil Co., Union Oil Corp., and Equitex Petroleum Co. EOC planned to drill an exploratory well during 1973.

Tenneco Ethiopia Inc. was preparing drilling sites at its concession area in southern Bale Province. The company planned to start drilling operations in the first quarter of 1972.

Table 9.—Ethiopia: Exports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1969	1970 [2]
METALS		
Aluminum, metal, unwrought and semimanufactures	27	NA
Copper, metal, including alloys:		
Scrap	93	180
Unwrought	--	39
Iron and steel:		
Metal:		
Scrap	233	NA
Semimanufactures	10	NA
Lead scrap	--	157
Other nonferrous metal scrap	122	[3] 92
NONMETALS		
Cement	22,621	NA
Lime	30	NA
Salt	178,301	NA
Stone and sand:		
Dimension stone, crude and worked	502	NA
Other	10	NA
Sands, natural	36	NA
Sulfur, crude	2	NA
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	1,234	NA

NA Not available.

[1] Reexports not included because only value data are available.

[2] Source: Statistical Office of the United Nations. Supplement to the World Trade Annual. V. 3 (Africa), Walker and Company, New York, 1972, pp. 243–245.

[3] Incomplete figure.

Table 10.—Ethiopia: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970 [1]
METALS		
Aluminum:		
Oxide and hydroxide	8	NA
Metal including alloys, all forms	641	239
Arsenic oxides and acid	9	NA
Copper including alloys, all forms	34	278
Iron and steel:		
Metal:		
Scrap and waste	678	NA
Pig iron including cast iron	--	127
Steel, primary forms	5,730	7,679
Semimanufactures	33,094	20,445
Lead including alloys, all forms	20	103
Manganese oxide	15	NA
Mercury .... 76-pound flasks	3	NA
Nickel including alloys, all forms	15	7
Platinum-group metals including alloys, all forms .... troy ounces	--	NA
Silver including alloys .... do	193	NA
Tin including alloys, all forms .... long tons	30	NA
Zinc including alloys, all forms	380	566
Other:		
Oxides, hydroxides and peroxides of metals, n.e.s	51	NA
Base metals including alloys, all forms, n.e.s	--	NA

See footnotes at end of table.

Table 10.—Ethiopia: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970[1]
NONMETALS		
Abrasives, natural, n.e.s.:		
Dust and powder of precious and semiprecious stones	(2)	NA
Grinding and polishing wheels and stones	121	NA
Asbestos	95	NA
Barite and witherite	915	NA
Borates, crude natural	--	NA
Cement	804	NA
Chalk	184	NA
Clays and products:		
Crude clays, n.e.s	276	NA
Products:		
Refractory (including nonclay bricks)	639	307
Nonrefractory	1,278	218
Cryolite and chiolite	16	NA
Diamond, industrial thousand carats	240	NA
Fertilizer materials:		
Crude	(2)	NA
Manufactured:		
Nitrogenous	558	NA
Phosphatic	1,129	1,940
Potassic	320	NA
Mixed	6,193	3,204
Ammonia	8	NA
Graphite, natural	(2)	NA
Lime	32	NA
Mica, crude and worked including splittings and waste	36	NA
Pigments, mineral:		
Natural, crude	138	NA
Iron oxides	12	NA
Precious and semiprecious stones, except diamond kilograms	42,500	NA
Salt	145	NA
Sodium and potassium compounds, n.e.s.:		
Caustic soda	1,760	3,445
Caustic potash	3	NA
Stone, sand and gravel:		
Dimension stone:		
Crude and partly worked	68	NA
Worked	3	NA
Gravel and crushed stone	15	NA
Sands, natural, all kinds	(2)	NA
Sulfur:		
Elemental:		
Other than colloidal	--	627
Colloidal	567	
Sulfuric acid	174	NA
Other nonmetals, n.e.s.:		
Crude:		
Meerschaum, amber	89	NA
Strontianite, mineral substances, n.e.s	231	NA
Slag and ash, n.e.s	750	NA
Oxides and hydroxides of magnesium, strontium, and barium	30	NA
Building materials of asphalt, asbestos and fiber cement and unfired nonmetals, n.e.s	971	NA
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	58	NA
Carbon black	1	NA
Coal, coke and briquets	9,897	NA
Petroleum:		
Crude thousand 42-gallon barrels	3,570	4,265
Refinery products:		
Gasoline, aviation do	133	69
Gasoline, motor do	15	30
Jet fuel do	7	168
Kerosine do	19	20
Distillate fuel oil do	179	175
Residual fuel oil do	(2)	--
Lubricants (including grease) do	30	25
Mineral jelly and wax do	25	18
Other:		
White spirit do	(2)	
Nonlubricating oils, n.e.s do	4	
Liquefied petroleum gas do	(2)	
Bituminous mixtures and petroleum bitumen do	4	
Total do	416	505
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	44	NA

[r] Revised. NA Not available.

[1] Source: Statistical Office of the United Nations. Supplement to the World Trade Annual. V. 3, (Africa), Walker and Company, New York 1972, pp. 260–264.

[2] Less than ½ unit.

THE FRENCH TERRITORY OF THE AFARS AND ISSAS [28]

Mineral industry activity in the French Territory of the Afars and Issas was confined chiefly to foreign trade in mineral commodities as shown in table 11. Exports of mineral commodities were mainly metals and semimanufactures valued at $16.4 million, petroleum lubricants valued at $1.3 million, and cement and building materials valued at $174,284. In 1970 imports of mineral products consisted mainly of metals and semimanufactures valued at $155.1 million,[29] petroleum and petroleum products valued at $82.4 million, and cement and building materials valued at $46.4 million.[30]

Table 11.—French Territory of the Afars and Issas: Apparent imports of mineral commodities [1]
(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum and alloys, semimanufactures	101	28
Iron and steel semimanufactures	4,691	1,161
Nonferrous metals and alloys, n.e.s. .... value, thousands	$26	$28
NONMETALS		
Cement, hydraulic	5,662	1,144
Fertilizer materials manufactured, phosphatic	450	--
MINERAL FUELS AND RELATED MATERIALS		
Petroleum refinery products, lubricants .... thousand 42-gallon barrels	3	6

[1] Compiled from trade statistics for selected trading partner countries, in the absence of official French Territory of the Afars and Issas trade returns.

Source: Statistical Office of the United Nations, 1969 and 1970 editions of the Supplement to the World Trade Annual. V. 3 (Africa), published by Walker and Co., New York, 1971 and 1972.

GAMBIA [31]

The mineral industry of Gambia consisted mainly of exploration for petroleum, for mineral deposits, and of trade in mineral commodities. Small quantities of stone and sand and gravel probably were produced for use in local construction.

Feasibility studies were conducted by the United Nations Development Program on a kaolin deposit in the Upper River area and on a deposit of ilmenite near the coast in Western Division. Tests on the kaolin indicate that it could be used in refractory products. The ilmenite, which has not been mined in recent years, has a favorable chemical composition and is in a good location for economic exploitation. At yearend, the British Petroleum Corp. relinquished its offshore petroleum exploration concession. Later the concession was awarded to Aracca Petroleum Corp. of the United States. The Government planned to award as many as four onshore and offshore oil exploration concession areas.

Foreign trade in mineral commodities consisted chiefly of imports of cement and iron and steel semimanufactures as shown in table 12. Some areas had occasional shortages of cement. Substantial increases in import duty collected on petroleum products were noted.

Table 12.—Gambia: Apparent imports of selected mineral commodities [1]
(Metric tons unless otherwise specified)

Commodity	1969	1970
Cement, hydraulic	5,581	2,183
Fertilizers, manufactured	1,560	497
Iron and steel semimanufactures	320	1,643
Petroleum refinery products:		
Lubricants .... thousand 42-gallon barrels	2	3
Asphalt and bitumen .... do	7	NA

NA Not available.

[1] Compiled from trade returns of 24 trading partner countries given in Statistical Office of the United Nations 1969 and 1970 editions to the Supplement to the World Trade Annual. V. 3 (Africa), published by Walker and Co., New York, 1971 and 1972.

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[28] Henry E. Stipp, physical scientist, Division of Ferrous Metals.

[29] Where necessary, values have been converted from Djibouti Francs (DF) to U.S. dollars at the rate of DF1=US$0.466.

[30] Marchés Tropicaux et Mediterranéens (Paris). 1970 Foreign Trade Figures. Nov. 27, 1971, p. 3698.

[31] Henry E. Stipp, physical scientist, Division of Ferrous Metals.

GUINEA [32]

The principal mineral activities in Guinea in 1971 centered on the production of bauxite and alumina and the planning and development of new bauxite mining ventures. Guinea produced about 4 percent of the world's bauxite in 1971. Bauxite reserves in Guinea have been estimated as high as 4 billion tons, or over 25 percent of the world's reserves.

Bauxite was produced by Compagnie International pour la Production de l'Alumine (FRIA) at Kimbo and by Harvey Aluminum, Inc., on Tamara Island. FRIA, an international consortium in which Olin Mathieson Chemical Corp. is the largest shareholder, converted bauxite to alumina at its Kimbo alumina plant, the only alumina facility in Guinea. Harvey shipped bauxite to its alumina plant on St. Croix, the Virgin Islands.

Guinea Bauxite Co. (CBG) continued construction of mining facilities and infrastructure for the huge Boké bauxite project. CBG is owned by the Government of Guinea (49 percent) and Halco Mining, Inc. (51 percent), a consortium consisting of Alcan Aluminium Ltd., Aluminum Co. of America, Harvey, and three European aluminum producers. The first bauxite exports from Boké were scheduled for January 1973. The International Bank for Reconstruction and Development approved an additional loan of $9 million to CBG to expand production capacity to 9 million tons per year, double the capacity originally planned.

In February, Swiss Aluminium Co. (Alusuisse) and the Government of Guinea signed an agreement to become equal partners in the development of the bauxite deposits near Tougué and created Société Mixte Guinée-Alusuisse (SOMIGA) for this purpose. The agreement includes provisions for construction of ore drying facilities, a town, a rail spur, and port facilities. Alusuisse reportedly agreed to provide $2 million for initial prospecting and infrastructure feasibility studies, which were to be completed in 2 years. High-grade bauxite was believed to occur in the

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[32] Horace F. Kurtz, industry economist, Division of Nonferrous Metals.

Table 13.—Guinea: Apparent foreign trade in selected mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1969	1970
EXPORTS		
METALS		
Aluminum:		
Bauxite	150,449	159,798
Oxide and hydroxide	366,693	420,776
Copper metal and alloys, scrap	33	31
Iron and steel:		
Ore and concentrate	--	2,622
Scrap	1,425	--
NONMETALS		
Diamond ..... value, thousands	$195	$39
IMPORTS		
METALS		
Aluminum and alloys, semimanufactures	1,049	940
Copper and alloys, semimanufactures ..... value, thousands	$43	NA
Iron and steel semimanufactures	7,018	45,265
NONMETALS		
Cement, hydraulic	9,875	15,085
Fertilizer materials, manufactured	1,556	6,061
Lime	16,343	19,982
MINERAL FUELS AND RELATED MATERIALS		
Petroleum refinery products:		
Kerosine ..... thousand 42-gallon barrels	17	48
Residual fuel oils ..... do	178	513
Lubricants ..... do	14	23
Other ..... do	15	24

NA Not available.

[1] Compiled from trade statistics for selected trading partner countries, in the absence of official Guinean trade returns.

Source: Official trade returns of the U.S.S.R. for 1969 and 1970, and Statistical Office of the United Nations, 1969 and 1970 editions of Supplement to the World Trade Annual. V. 3 (Africa), published by Walker and Co., New York, 1971 and 1972.

Tougué area, and estimates of reserves of 2 billion tons have been reported. Production of as much as 8 million tons per year was contemplated.

Another agreement, signed in April, provided for prospecting and exploiting the bauxite near Dabola in central Guinea. For this joint venture, the Government (51 percent) and the Yugoslavian firm, Energoproject (49 percent), formed the company, Société des Bauxites de Dabola (SBD). Feasibility studies for the project will include consideration of a 300,000-ton-per-year alumina plant.

The Government was reported to have signed an agreement late in 1970 with the U.S.S.R. for the development of bauxite deposits in the Kindia region.

Plans for developing the iron ore deposits in the Nimba Mountains near the southernmost border of Guinea remained incomplete pending completion of feasibility studies and a decision on how to transport the ore to the coast for shipment abroad. Under consideration were plans to ship the ore by rail to Buchanan, Liberia, or to Conakry, Guinea, which would require greater investment in railroad construction. The Government was also investigating the feasibility of exploiting iron ore deposits at Mount Simandou, about 60 miles north of the Nimba Mountains.

IVORY COAST[33]

Mineral production in the Ivory Coast expanded significantly in 1971 as the result of successful development work by the diamond producers and growing domestic demand. Output of diamond, cement, and petroleum refinery products, the country's three principal mineral commodities, each exceeded their 1970 levels by sizable margins.

Although the mineral industry has never been an important sector of the Ivory Coast economy, it is expected to become one of the principal growth areas. Encouragement of export industries is a major thrust of the country's new development plan. The investigation of the iron ore deposits near Man and exploration for petroleum in the coastal area offer a potential for major economic expansion.

Government Policies and Programs.—The Government unveiled a new development plan covering the period 1971–75. The plan envisages no significant changes from the policies of financial conservatism and encouragement of foreign investment that have been responsible for the rapid economic growth achieved in the previous decade. A major emphasis of the plan is on the development of export industries such as mining, the leading prospects for which are the iron deposits under investigation near Man and the offshore exploration for petroleum.

PRODUCTION

Output of the country's mines, quarries, and mills increased considerably in 1971. Production of diamond, cement, and petroleum refinery products each recorded sizable gains. The only significant decrease occurred in manganese, resulting from the closure of the one operating mine in March 1970.

Value of mineral production rose about 35 percent to a total in excess of $28 million. This figure is considerably larger than the totals reported here a year ago because the earlier figures omitted cement, which is one of the largest classes of mineral products. A comparable total for 1970 would be in excess of $20 million. The term "in excess of" is used to indicate the unreported production of sand and gravel, and stone.

Diamond production jumped 53 percent to 326,370 carats from 212,808 carats in 1970, reflecting the development programs of the two private diamond operators. Value of diamond output was up 41 percent, an indication that the proportion of industrial diamonds was higher in 1971.

A high level of construction activity boosted cement production 25 percent to an estimated 500,000 tons from 400,000 tons the year before. Output of the petroleum refinery also surpassed the 1970 level due to higher production rates for fuel oil.

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[33] David G. Willard, economist, Division of Nonmetallic Minerals.

No manganese was produced in 1971, and the remaining stocks were exported.

Statistics on mineral production for the years 1969–71 are included in table 1.

TRADE

The mineral industry contributed slightly less to the nation's foreign trade balance in 1970, according to the latest statistics which are available. Exported mineral commodities declined in value for the second successive year, while the value of mineral-related imports rose significantly. It appears possible that exports of diamond are undervalued, thereby inflating somewhat the unfavorable balance of mineral commodity trade. Balances of total commodity trade and mineral commodity trade are shown in the following tabulation in million dollars:

	1968	1969	1970
Total commodity trade:			
Exports	378	426	469
Imports	280	311	388
Balance	98	115	81
Mineral commodity trade:			
Exports	[r]14.0	[r]10.5	9.7
Imports	46.0	43.1	53.9
Balance	[r]–32.0	[r]–32.6	–44.2

[r] Revised.

A reduction in exports of petroleum refinery products was mainly responsible for the lower value of mineral exports, a reflection of the country's growing domestic demand for the output of its refinery.

Cement exports decreased for the same reason. Shipments of diamond were lower in both quantity and value in 1970 than in 1969, despite an increase in production. Although manganese production had terminated, more ore was exported in 1970 due to the sale of accumulated stocks.

A wide variety of minerals and related products were imported. Crude and semimanufactured metals and crude petroleum together accounted for more than half of the total value of imports. Purchases of primary and semimanufactured metals were responsible for the majority of the nearly $11 million import gain; other classes showing sizable increases were petroleum refinery products and manufactured fertilizers.

Improvement in the mineral trade balance is likely in 1971 as a result of the growth in diamond production. The additional $2 million of diamond output can be expected to provide an equivalent boost to the country's mineral exports.

Statistics on exports and imports of minerals and related commodities in 1969 and 1970 are given in tables 14 and 15.

COMMODITY REVIEW

Iron Ore.—Exploration work on the Mt. Klahoyo iron ore deposit near Man was completed by Pickands Mather & Co. in 1971, but no announcement was made of the results or of a definite schedule for construction of the project. A potential excess of world iron ore capacity may have hindered efforts to line up customers and financing.[34] Construction of the mine and other facilities, including transportation to the ocean, will take 4 years after a go-ahead decision is made.

Two Japanese firms—Mitsubishi Shoji Kaisha, Ltd. and Sumitomo Shoji Kaisha, Ltd.—agreed to join Pickands Mather in the project. The two firms will share in the exploration and investment costs and will probably be customers for the ore. Participation by additional companies will be needed before the project can get under way.[35]

An iron ore deposit at Monagaga, on the coast near the new port of San Pedro, was being studied by the Government's Bureau de Recherches Géologiques et Minières (BRGM). If the deposit proves feasible, the ore will be processed into a sponge for use by local steel works.[36]

Petroleum.—Preliminary investigations were carried out by Esso, operator of the consortium which also includes Shell and Enterprise de Recherches et d'Activitiés Pétrolières (ERAP) in the coastal lagoon region near the Ghana border and offshore. A drilling program was scheduled to begin in 1972.[37]

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[34] American Metal Market. UN Report Predicts Difficulties for Iron Ore Producers. V. 78, No. 161, Aug. 20, 1971, p. 1.

[35] American Metal Market. Japanese Firms Join Ore Pellet Project. V. 78, No. 96, May 19, 1971, p. 4.

[36] Mining Magazine. Panorama. V. 126, No. 1, January 1972, p. 9.

[37] U.S. Embassy, Abidjan, Ivory Coast. State Department Airgram A-3, Jan. 15. 1971, p. 7.

Table 14.—Ivory Coast: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum metal including alloys, all forms	589	539
Antimony metal including alloys, all forms ... kilograms	252	--
Copper:		
Scrap	1,129	1,537
Metal including alloys, unwrought and semimanufactures	8	1
Iron and steel metal:		
Scrap	r 5,007	11,229
Pig iron, ferroalloys, and similar materials	r 3	8
Semimanufactures	631	839
Lead:		
Oxide	7	(1)
Metal including alloys, all forms	144	245
Manganese ore and concentrate	53,910	74,233
Nickel metal, including alloys, all forms	--	3
Tin metal including alloys, all forms ... long tons	50	(1)
Zinc:		
Oxide	2	1
Metal including alloys, all forms	5	9
Other:		
Ore and concentrate, n.e.s ... kilograms	250	532
Metalloids, n.e.s	8	12
NONMETALS		
Cement, hydraulic	24,781	22,748
Chalk	--	2
Clays and products (including all refractory brick):		
Crude, bentonite	10	2
Products:		
Refractory (including nonclay bricks)	12	25
Nonrefractory	75	42
Diamond:		
Gem, not set or strung ... carats	r 3,670	5,660
Industrial ... do	r 314,960	209,545
Diatomite	--	1
Fertilizer materials:		
Crude	r 28	21
Manufactured:		
Nitrogenous	26	47
Phosphatic	25	200
Potassic	200	43
Other and mixed	11	7
Ammonia	1	1
Gypsum and plasters	r 43	20
Lime	95	102
Pigments, mineral, natural, crude	8	3
Quartz ... kilograms	21	--
Salt	672	236
Sodium and potassium compounds, n.e.s	r 386	258
Stone, sand and gravel:		
Dimension stone, crude and partly worked	119	3
Gravel, crushed rock and dolomite	2	4
Limestone	8	(1)
Sulfur:		
Elemental, all forms ... kilograms	1,050	218
Sulfuric acid	r 12	10
Talc and steatite	1	5
Other crude nonmetals, n.e.s	r 1	3
MINERAL FUELS AND RELATED MATERIALS		
Carbon black ... kilograms	--	23
Coal	--	2
Coke and semicoke	16	6
Petroleum refinery products:		
Gasoline ... thousand 42-gallon barrels	203	256
Kerosine ... do	124	134
Distillate fuel oil ... do	161	179
Residual fuel oil ... do	990	47
Liquefied petroleum gas ... do	9	14
Bitumen ... do	r 2	1
Other ... do	10	25
Total ... do	r 1,499	656

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r Revised.

[1] Less than ½ unit.

Table 15.—Ivory Coast: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum:		
Oxide and hydroxide	2	10
Metal including alloys, all forms	2,944	4,084
Antimony metal including alloys, all forms	2	1
Chromium oxide and hydroxide	8	10
Cobalt metal including alloys, all forms ... kilograms	15	146
Copper:		
Ore and concentrate ... do	--	445
Metal including alloys, all forms	185	252
Gold metal, unworked or partly worked ... troy ounces	r 2,733	16,108
Iron and steel:		
Roasted pyrite	--	3
Metal:		
Scrap	56	91
Pig iron, ferroalloys, and similar materials	8	12
Steel, primary forms	r 285	8,391
Semimanufactures	69,906	92,581
Lead:		
Ore and concentrate	2	--
Oxides	98	69
Metal including alloys, all forms	120	100
Nickel metal including alloys, all forms	2	1
Platinum-group metals and silver:		
Metals including alloys:		
Platinum group ... troy ounces	--	64
Silver ... do	6,237	10,256
Thorium and uranium ... kilograms	16	7,557
Tin metal including alloys, all forms ... long tons	r 16	16
Titanium:		
Ore and concentrate	--	40
Oxides	215	232
Zinc:		
Oxides	89	87
Metal including alloys, all forms	49	386
Other:		
Ores and concentrates:		
Of molybdenum and tin ... kilograms	23	4
Of base metals, n.e.s	(1)	64
Ash and residue containing nonferrous metals	--	30
Oxides, hydroxides and peroxides of metals, n.e.s	14	31
Waste and sweepings of precious metals	--	20
Sands, metal bearing	92	160
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc	17	11
Grinding and polishing wheels and stones	95	120
Asbestos	2	2
Barite and witherite	131	236
Boron materials:		
Crude natural borates	2	10
Oxide and acid ... kilograms	245	92
Cement	355,976	371,201
Chalk	770	890
Clays and products (including all refractory brick):		
Crude n.e.s.:		
Kaolin	39	42
Bentonite	7	98
Refractory	13	30
Other	(1)	40
Products:		
Refractory (including nonclay bricks)	783	782
Nonrefractory	4,581	3,518
Diamond:		
Gem ... carats	[2] 130,000	50,000
Industrial ... do	--	125,000
Diatomite	39	51
Fertilizer materials:		
Crude	4,534	5,217
Manufactured:		
Nitrogenous	3,498	2,633
Phosphatic	3,874	4,584
Potassic	12,277	24,214
Other mixed	9,436	5,090
Ammonia	36	1,472
Graphite, natural ... kilograms	2,680	203
Gypsum and plasters	18,303	18,797

See footnotes at end of table.

Table 15.—Ivory Coast: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970
NONMETALS—Continued		
Lime	2,957	3,667
Magnesite	1	4
Mica, all forms	5	(1)
Pigments, mineral:		
Natural, crude	75	70
Iron oxides, processed	34	51
Precious and semiprecious stones, except diamond ... kilograms	128	32
Salt	18,596	24,950
Sodium and potassium compounds, n.e.s	3,498	4,441
Stone, sand and gravel:		
Dimension stone:		
Crude	233	591
Worked	160	803
Dolomite, chiefly refractory grade	3,881	6,446
Gravel and crushed rock	2,152	1,743
Quartz	31	65
Sulfur:		
Elemental:		
Other than colloidal	9	4,928
Colloidal	1	8
Sulfur dioxide	--	4
Sulfuric acid	199	363
Talc and related materials	490	687
Other nonmetals, n.e.s.:		
Crude:		
Meerschaum, amber, jet	250	--
Other	803	1,548
Fluorine, iodine and chlorine	55	58
Metalloids, n.e.s	1	6
Metallurgical residues not containing metals	16	--
MINERAL FUELS AND RELATED MATERIALS		
Carbon black	78	50
Coal and briquets	35	35
Coke and semicoke	205	255
Peat briquets	27	23
Petroleum:		
Crude ... thousand 42-gallon barrels	6,250	5,905
Refinery products:		
Gasoline ... do	[r]45	150
Kerosine ... do	14	34
Distillate fuel oil ... do	[r]107	288
Residual fuel oil ... do	3	3
Lubricants ... do	87	97
Liquefied petroleum gas ... do	33	1
Bitumen ... do	49	50
Other ... do	[r]10	10
Total ... do	[r]348	633
Crude chemicals from coal, oil and gas distillation	840	1,109

[r] Revised.
[1] Less than ½ unit.
[2] Believe to include some industrial diamond.

Announcement was made of plans for a further expansion of the Société Ivorienne de Raffinage refinery at Abidjan. Capacity of the refinery is to be doubled from 20,000 to 40,000 barrels per day. Construction is scheduled to begin in 1972 and to be completed in 1973.[38]

Other Minerals.—Exploration programs of the Government agencies associated with mining—BRGM and Société pour le Développement Minier de la Côte d'Ivoire (SODEMI)—continued in many parts of the country in 1971. BRGM conducted basic geological studies and searches for magnetic and geochemical anomalies in addition to development work on the previously mentioned iron ore deposit at Monagaga. A United Nations project team began a program of deep drilling to investigate deposits of copper and molybdenum discovered by SODEMI at Mameli, near Bouake. Other investigations uncovered additional diamond reserves and studied deposits of clay and ornamental stone.[39]

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[38] Oil and Gas Journal. International Briefs. V. 70, No. 13, March 27, 1972, p. 46.
[39] Work cited in footnote 36.

LESOTHO [40]

Diamond production in Lesotho was considerably lower in 1971 because of the removal of native diggers from certain diamond pipes to make way for the large-scale exploration programs being conducted by several major mining companies and because of restrictions on the numbers of diggers allowed to work at other pipes. Since diamond is the country's only mineral export, the balance of mineral trade was significantly worsened.

The first results obtained from the diamond exploration programs were less than encouraging. One exploration permit was terminated and another was extended to give the company time for additional investigations before making its final decision. A third exploration program was just getting under way. The United Nations Development Program's survey of diamond resources also began during the year, and several new kimberlite areas were discovered.

An agreement in principle was reached with a Canadian oil company to search for petroleum in Lesotho. An application was also made to mine a small coal deposit.

PRODUCTION AND TRADE

Output of diamond, Lesotho's only mineral product, tumbled by 59 percent in 1971, to 6,815 carats from 16,539 carats in 1970. Value of production was down to $284,000 in 1971 from $913,000 in 1970, a decrease of 69 percent. Gems comprised 15 percent of the 1971 output as against 21 percent in 1970.

The sharp decline in production stemmed from restrictions placed on the activities of native diamond diggers. Resentment among the diggers, who had been forced to move from Letseng-la-Terai to Kao, flared into violence in 1970. Consequently, when the same diggers were removed from Kao to Limpane and Liqhobong in 1971, the Government set limits on the numbers allowed in the new fields, causing a drastic reduction in operators and output.

Crushed stone, precast concrete, and cement bricks were also produced but the quantities were not reported. Small numbers of amethyst and agate gem stones were obtained by native diggers and sold to jewelry dealers in the Republic of South Africa.

Lesotho's balance of mineral trade worsened considerably in 1970, the last year for which data are available, as a result of the drop in diamond production which occurred in that year. Diamond constitutes the country's sole mineral export, and the entire production is sold abroad. Imports of mineral commodities consist mainly of refined petroleum products, the demand for which has maintained a persistent uptrend. The values of total trade and mineral trade in 1968 through 1970 were as follows in thousand dollars:

	1968	1969	1970
Total commodity trade:			
Exports	4,732	5,697	5,202
Imports	33,513	33,470	32,026
Balance	−28,781	−27,773	−26,824
Mineral commodity trade:			
Exports	527	1,643	913
Imports	2,157	2,431	2,506
Balance	−1,630	−788	−1,593

Source: Standard Bank. Annual Economic Review, Botswana, Lesotho, Swaziland. November 1971, p. 17.

COMMODITY REVIEW

Nonmetals.—*Diamond.*—Rio Tinto Zinc Corp. completed its 3-year exploration program at the Letseng-la-Terai diamond pipe in 1971, but no announcement was made of the results. The company requested and received an extension of its exploration permit to March 31, 1972. Reportedly, the deposit was somewhat disappointing, and additional investigation was required before the decision to open or abandon the mine could be made.[41]

A permit for exploration of the Kao diamond pipe during the period 1971–74 was granted to the Maluti Diamond Corp. Maluti was a joint venture of Newmont Mining Corp. and Lonrho, Ltd., but the Lonrho interest was subsequently sold to Newmont. The Lesotho National Development Corp. retained the option to purchase up to 30 percent of the shares. Native diggers at Kao were moved to the nearby Limpane and Liqhobong pipes;

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[40] David G. Willard, economist, Division of Nonmetallic Minerals.

[41] Mining Journal. The Industry in Action. V. 278, No. 7117, Jan. 14, 1972, p. 30.

and the exploration program was under way at yearend. The Kao pipe had been prospected about 10 years earlier by De Beers Diamond Corp., which declared it to be uneconomic.[42]

Lonrho, Ltd., terminated its exploration of the Mothae diamond pipe after a 2-year sampling program gave unfavorable results.

Work was begun on the Diamond Exploration Project, a 4-year attempt by the United Nations Development Program to discover new diamond pipes in northern Lesotho and to provide an accurate survey of known pipes. Several aerial surveys were carried out using various photographic methods under the direction of North American Rockwell Corp., and a number of new kimberlite areas were identified.

A diamond cutting and polishing plant, named Lesotho Diamond Works (Pty) Ltd., was established in Maseru in 1971. Jointly owned by Mr. J. Gubits of Israel and Lesotho National Development Corp., the plant employs 22 people and exported 636 carats of sawn or polished diamonds during 1971.[43]

Mineral Fuels.—*Coal.*—An application to mine the coal deposit at Qhalesi Hill was made by Bataung Coal Mining Co. The deposit, which is only 6 inches thick, has been known for many years but considered uneconomic. Qhalesi Hill is located near the town of Mohale's Hoek in southwestern Lesotho.[44]

Petroleum.—An agreement in principal has been reached with Ponder Oils, Ltd., of Winnipeg, Canada, to conduct a petroleum prospecting program in Lesotho over a 3-year period beginning late in 1971. The program is expected to include geological and geophysical investigations along with drilling of promising structures.[45]

MALAGASY REPUBLIC [46]

Mining activity in the Malagasy Republic moved ahead; but more slowly in 1971 than in the preceding years. Production gains were relatively small because of marketing problems encountered by certain of the island's products. Exploration continued unabated but no significant successes were achieved during the year. Finally, a change of government added an element of uncertainty to the picture.

Higher output levels of some gem, semiprecious, and ornamental stones, salt, and graphite were the main sources of a 2-percent increase in the value of mineral production. An offsetting deficit was caused by a sharp drop in the production of mica. The country's balance of mineral trade benefited from additional chromite shipments in 1970, but a slight decline appeared likely in 1971 due to smaller production of several export commodities.

Investigation of the bauxite deposits near Manantenina continued, but prospects for their development were dimmed slightly by the weakening world aluminum market. Offshore petroleum exploration activities were in full swing on all sides of the island, although these efforts remained so far unsuccessful. Several other of the country's numerous mineral deposits—including those of nickel, iron, and diamond—were also under study during the year.

A revolution occurred early in 1972, accompanied by an upswing in nationalistic feeling. Initial actions of the new government indicated a desire for increased local control of industry coupled with a recognition of the country's continuing need for economic development and for investment capital. The long-run effects of the political change remained to be seen.

PRODUCTION

Mineral production figures for the Malagasy Republic in 1971 showed a mixture of increases and decreases, with the increases predominating. Three of the country's five most important mineral commodities—cement, graphite, and salt—recorded output gains. The other two, petroleum refinery products and mica showed declines in volume.

A smaller quantity of gem, semiprecious, and ornamental stones was produced, but total value was higher because of greater output of the more valuable types of ornamental quartz.

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[42] Engineering and Mining Journal. Exploration Roundup. V. 172, No. 11, November 1971, p. 230.

[43] Lesotho Department of Mines and Geology. Annual Report, 1971, pp. 4, 10–14.
Lesotho National Development Corp. Annual Report, 1971, p. 8.

[44] Standard Bank. Annual Economic Review, Botswana, Lesotho, Swaziland. November 1971, p. 15.

[45] U.S. Embassy, Maseru, Lesotho. State Department Telegram 161316, September 1971, 1 p.

[46] David G. Willard, economist, Division of Nonmetallic Minerals.

Recorded mineral production of the Malagasy Republic rose only 2 percent in estimated value in 1971, from $9.7 million to $10.1 million, much below the 5½-percent average gain of the previous 2-year period. Higher values of gem, semiprecious, and ornamental stones, salt, and graphite contributed most of the increase. The entire production of sand and gravel, and stone in the country is unrecorded.

Statistics on mineral production in the Malagasy Republic during 1969–71 are included in table 1.

TRADE

Exports of chromite increased reflecting the first full year of operation of the new mine and boosted the country's balance of mineral trade in 1970, according to the most recent, complete statistics available. Shipments of chromite concentrate totaled 130,341 tons worth $3,073,000, up from 32,980 tons worth $792,000 in 1969. That increase alone represented about 25 percent of the total value of mineral exports in the previous year. Other minerals showing significantly higher exports were graphite, up 10 percent in quantity and 20 percent in value, and gem, semiprecious, and ornamental stones which nearly doubled in volume and increased 7 percent in value. The only sizable decline was in exports of mica which were down 48 percent, although their value dropped by only 25 percent. Values of total commodity trade and mineral commodity trade in 1968 through 1970, were as follows in million dollars:

	1968	1969	1970
Total commodity trade:			
Exports	116	117	145
Imports	171	186	171
Balance	−55	−69	−26
Mineral commodity trade:			
Exports	7.3	9.3	13.3
Imports	19.9	NA	29.7
Balance	−12.6	NA	−16.4

NA Not available.

Sources: Agency for International Development. Malagasy Republic, Summary of Basic Data, rev. No. 260, June 1971, p. 8.

Malagasy Republic. Statistiques du Commerce Extérieur de Madagascar. V. 2, issues for 1968, 1969, and 1970.

A slight worsening in the balance of mineral trade is expected in 1971, stemming from smaller exports of several leading commodities. Lower preliminary figures are shown for the value of mica, graphite, and gem stone exports, and these more than offset a further increase in the value of chromite shipments.

Exports and imports of minerals and related commodities in 1969 and 1970 appear in tables 16 and 17.

COMMODITY REVIEW

Metals.—*Bauxite.*—Compagnie de Produits Chimiques et Péchiney continued its investigation of bauxite deposits near Manantenina which are estimated to contain 70 million tons of ore with an average grade of 45 percent alumina. Kaiser Engineers is associated with Péchiney in the project. An exploration company named Ankarabe was formed in October 1971 by agreement between Péchiney and the Malagasy Government. Still to be resolved were questions regarding the degree of processing to be done prior to exporting and the construction of transportation and port facilities. Furthermore, the project's feasibility remained in doubt on account of the investment cost involved and the weakness of the world aluminum market.

The Malagasy Government had previously discussed, with both Kaiser and Japanese interests, proposals for hydroelectric power developments which could support further processing of the bauxite. However, no new developments of this type were reported during the year.

Exploration of two other bauxite deposits by the Société Aluminum was terminated, and the permits were relinquished.[47]

Chromite.—Production of chromite from the new mine at Lake Alaotra remained at approximately the 1970 level. Compagnie Minière d'Andriaména (COMINA) encountered marketing difficulties abroad and was forced to stockpile a sizable portion of the 1971 output. As a result, the production target for 1972 has been lowered by about 20 percent.[48]

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[47] U.S. Embassy Tananarive, Malagasy Republic. State Department Airgram A–107, Aug. 11, 1972, pp. 3–4.

American Metal Market. Madagascar Bauxite Exploration Planned. V. 78, No. 200, Oct. 18, 1971, p. 11.

Metal Bulletin. Japan Into Malagasy. No. 5595, Apr. 30, 1971, p. 19.

Mining Annual Review. Malagasy. June 1972, p. 355.

[48] Industrial Minerals. Companies and Minerals. No. 58, July 1972, p. 38.

Table 16.—Malagasy Republic: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Bauxite and concentrate	102	--
Beryl ore and concentrate	76	31
Chromite	32,980	130,341
Copper metal and alloys:		
Unwrought and scrap	259	340
Semimanufactures	1	(1)
Iron and steel:		
Scrap	3,305	5,047
Semimanufactures	994	663
Lead metal and alloys, all forms	9	15
Manganese ore and concentrate	7	--
Zinc metal and alloys, all forms	10	20
Other ore and concentrate	25	38
NONMETALS		
Abrasives, natural garnet	(1)	33
Cement, hydraulic	6	5
Clays and products	(1)	4
Graphite, natural	18,514	20,307
Lime	18	11
Mica, all forms	2,319	1,201
Precious and semiprecious stones including quartz crystal, except diamond..kilograms	76,683	141,495
Salt and brine	1,870	2,798
Stone, sand and gravel	79	95
MINERAL FUELS AND RELATED MATERIALS		
Coal and coke including briquets	20	--
Petroleum refinery products:		
Gasoline thousand 42-gallon barrels	292	258
Kerosine do	117	144
Distillate fuel oil do	204	231
Residual fuel oil do	1,026	1,359
Lubricants do	(1)	(1)
Other do	1	1
Mineral tar and other coal–, petroleum–, or gas–derived crude chemicals	5	--

[1] Less than ½ unit.

Table 17.—Malagasy Republic: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum:		
Oxide and hydroxide	1	264
Metal, and alloys, all forms	795	691
Chromium, oxide and hydroxide	1	1
Copper metal and alloys, all forms	541	162
Gold metal unworked or partly worked troy ounces	10,288	3,472
Iron and steel:		
Ore and concentrate	8	--
Metal:		
Scrap	83	(1)
Pig iron, ferroalloys, and similar materials	7	97
Steel, primary forms	(1)	--
Semimanufactures	56,043	51,429
Lead metal and alloys, all forms	337	379
Mercury 76-pound flasks	2	7
Nickel and alloys, all forms	(1)	3
Silver metal and alloys troy ounces	4,147	5,594
Tin metal and alloys, all forms long tons	11	16
Titanium oxides	84	51
Zinc:		
Oxide and hydroxide	40	44
Metal and alloys, all forms	95	140
Other metals and alloys, all forms	16	30
NONMETALS		
Abrasives:		
Emery, corundum and other crude natural	21	32
Grinding wheels and stones	57	41
Asbestos	17	13
Cement	63,545	72,680
Chalk	598	548

See footnotes at end of table.

Table 17.—Malagasy Republic: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970
NONMETALS—Continued		
Clays and products (including all refractory brick):		
Crude, n.e.s	802	1,304
Products	1,114	[2] 14
Diamond, all grades thousand carats	25	60
Diatomaceous earth	5	55
Fertilizer materials:		
Crude and manufactured:		
Nitrogenous	5,908	4,887
Phosphatic	1,015	5,744
Potassic	6,791	4,343
Other including mixed	10,508	15,849
Ammonia	36	51
Gypsum and plaster	3,156	5,096
Lime	926	885
Magnesite	72	5
Mica, crude and worked	10	15
Pigments, mineral including iron oxide	229	219
Salt and brine	908	978
Sodium and potassium compounds, caustic soda	1,125	1,698
Stone, sand and gravel:		
Dimension stone	53	--
Dolomite	72	37
Gravel and crushed rock	6	119
Sand excluding metal bearing	17	75
Sulfur:		
Elemental, all forms	22	17
Sulfur dioxide	3	5
Sulfuric acid	89	102
Talc, steatite, soapstone and pyrophyllite	84	30
Other:		
Crude nonmetals n.e.s	[r] 6,753	7,185
Oxides and hydroxides of magnesium, strontium, and barium	2	(1)
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	998	NA
Coal including briquets, all grades	18,643	20,994
Coke and semicoke	75	54
Petroleum:		
Crude and partly refined thousand 42-gallon barrels	3,633	4,206
Refinery products:		
Gasoline do	125	85
Kerosine and jet fuel do	6	1
Distillate fuel oil do	115	14
Residual fuel oil do	1	9
Liquefied petroleum gas do	1	1
Lubricants do	67	55
Mineral jelly and wax do	21	34
Other:		
Petroleum coke do	8	8
Bitumen and other residues do	62	1
Bituminous mixtures do	1	(1)
Total do	407	208
Mineral tar and other coal–, petroleum–, or gas–derived crude chemicals	358	624

[r] Revised. NA Not available.
[1] Less than ½ unit.
[2] Partially reported figure.

Iron Ore.—Discovery was reported of an iron seam at Ambonimahavony, near Antsirabe and close to the rail line from Tananarive. The deposit was estimated to contain 15 million tons of ore with an average grade of 50 percent iron. Potential feasibility of the project is enhanced by its suitability for surface mining and its location convenient to rail transportation.[49]

Société Aluminum Suisse extended its program of drilling at a recently discovered magnetite deposit.[50]

Nickel.—A program of appraisal drilling was carried out at the lateritic nickel deposit near Moramanga in 1971. Société le Nickel was operator for the combine which also included Anglo-American Corp of South Africa, Ltd., Ugine-Kuhlman S.A., and the Bureau de Recherches Géologiques et Minières (BRGM). The deposit was estimated to contain 120 million metric tons of ore grading 1.2 percent nickel. According to spokesmen for the combine, the deposit must be able to sustain production at a 30,000-ton-per-year level for mining to be economically feasible. A report is expected in 1972.[51]

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[49] Mining Journal. The Industry in Action. V. 278, No. 7118, Jan. 21, 1972, p. 51.

[50] Fourth work cited in footnote 47.

Another nickel exploration program began in 1971 in a 10,000-square-kilometer area in northern Madagascar.[52]

Nonmetals.—*Gem, Semiprecious, and Ornamental Stones.*—De Beers Consolidated Mines was given permission to prospect for diamond in Madagascar in an agreement signed with the Malagasy Government. Geologists collected 20,000 bags of samples which were shipped to the Republic of South Africa for analysis. Further investigations will be conducted at specific sites if the analyses are favorable.[53]

Production of gem and other valuable stones has risen sharply in the last 2 years. Their total value has increased fivefold from $96,000 in 1969 to $483,000 in 1971. Higher output of ornamental quartz—particularly the rose, geode, hematoid, and smoky varieties—contributed heavily to the gain.

Graphite.—Both quantity and value of graphite production have exhibited steady growth during recent years. Output has gone up from 14,890 tons in 1967 to 20,025 tons in 1971, and its value rose from $1.1 million to $1.5 million over the same period. Problems in obtaining supplies from other world sources of graphite have created a tighter market, particularly for the higher grades.

Mineral Fuels.—*Petroleum.*—Success again eluded the companies searching for petroleum in and around the Malagasy Republic in 1971. A total of 14 companies grouped into seven combines were active both onshore and offshore. Drilling was under way or completed on eight wells, while seismic tests were being conducted at other concessions. Continued lack of success compelled some of the groups to reevaluate their positions, and a decline in drilling activity appears likely in 1972.

Compagnie des Pétroles Total Madagascar (COPETMA), combined with Esso and Texas Gulf Sulfur Corp., drilled or completed three unsuccessful tests during the year. Continental Oil Co. (CONOCO) sunk a dry hole on its joint concession with Société des Pétroles de Madagascar (SPM) and started another well on a concession held jointly with Chevron Oil Co. CONOCO also planned to begin seismic testing in the Majunga basin permit area which it shares with SPM.

AGIP, in combination with Esso and Jack Grynberg and Associates, halted its operations in order to reevaluate after putting down two dry holes. Chevron, operating with Frontier Petroleum Co., drilled one well which was redirected after hitting a small gas pocket. Tenneco Oil Co. and Israel National Oil Co. were both engaged in seismic testing. Eason Oil Co. relinquished part of its original permit area after completing preliminary studies and requested and received a 2-year extension on the remainder.[54]

A further expansion of the country's oil refinery at Tamatave was under way in 1971 with completion scheduled for May 1972. Total capacity is to be more than doubled, increasing from 14,000 barrels per day to 31,500 barrels per day.[55]

MALAWI[56]

The mineral industry of Malawi contributed minor value to the economy as represented by the gross national product of $382.8 million[57] in 1971. Agriculture is the dominant industry in Malawi and over 90 percent of the population is engaged in agriculture, many at the subsistence level.

Activity in the minerals industry consisted mainly of economic studies and reserve evaluation of the Mulanje bauxite deposit. Production of mineral commodities was confined to quarrying 101,000 tons of limestone for use in the manufacture of cement. Unrecorded quantities of stone and sand and gravel also were produced for use in local construction. Foreign trade

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[51] Fourth work cited in footnote 47.
Engineering and Mining Journal. Exploration Round-up. V. 173, No. 7, July 1972, p. 25.

[52] Enginering and Mining Journal. Exploration Round-Up. V. 172, No. 7, July 1971, p. 144.

[53] Engineering and Mining Journal. Exploration Round-Up. V. 172, No. 6, June 1971, p. 278.

[54] U.S. Embassy Tananarive, Malagasy Republic. State Department Airgram A-63, May 25, 1971, 2 pp.
American Association of Petroleum Geologists Bulletin. Malagasy Republic. V. 55, No. 9, September 1971, pp. 1579–1583.
Eason Oil Co. 1971 Annual Report. President's Report, Operations, pp. 7–8.

[55] Oil and Gas Journal. Worldwide Construction. V. 70, No. 14, Apr. 3, 1972, p. 85.

[56] Henry E. Stipp, physical scientist, Division of Ferrous Metals.

[57] Where necessary, values have been converted from Malawi kwacha (MK) to U.S. dollars at the rate of MK1=US$1.20.

Table 18.—Malawi: Foreign trade in selected mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1969	1970
EXPORTS		
METALS		
Iron and steel, pig iron and ferroalloys	459	--
NONMETALS		
Asbestos	363	--
IMPORTS		
METALS		
Aluminum and alloys, semimanufactures	255	48
Iron and steel semimanufactures	r 6,081	7,775
Nonferrous metals, n.e.s. ... value, thousands	$31	$8
NONMETALS		
Clay products:		
Refractory	100	277
Nonrefractory	221	268
Fertilizer materials, manufactured:		
Nitrogenous	4,963	12,790
Other, n.e.s	1,289	--
MINERAL FUELS AND RELATED MATERIALS		
Petroleum refinery products, lubricants ... thousand 42-gallon barrels	1	1

r Revised.

[1] Compiled from trade statistics for selected trading partner countries, in the absence of official Malawi trade returns.

Source: Statistical Office of the United Nations, 1969 and 1970 editions of the Supplement to the World Trade Annual. V. 3 (Africa), published by Walker and Co., New York, 1971 and 1972.

in mineral commodities consisted mainly of imports of iron and steel semimanufactures, fertilizer materials, and petroleum products.

The Mulanje bauxite deposit was being evaluated by a team of specialists from London and the Rhodesia Mining and Land Co. Ltd. (Lonrho) to determine the size and nature of the deposit, the cost of electrical power, and the cost of rail transport of aluminum from Malawi to a port of export.

Exploratory drilling on Mount Mulanje was completed at yearend and many bauxite samples were sent to a laboratory in Switzerland for analysis. The results of these tests were expected to define the size and composition of the deposit. A total of $240,000 has been spent on the bauxite survey and $120,000 on exploration for other minerals, including strontianite in the Matope Plain near Bolaka. Present estimates indicate reserves of 80 to 90 million tons of bauxite sufficient to support an aluminum production plant of 125,000-ton-per-year capacity. This plant would require an estimated 235 million watts of electricity, which could be obtained from a hydroelectric facility to be constructed on the Shire River, southern Malawi. The cost of transporting aluminum from the vicinity of Mount Mulanje to ports in Mozambique will be determined when new rate quotations are received from railroad authorities.

Optichem (Malawi) Ltd. was expanding its fertilizer plant in order to supply increasing demand for fertilizers of all kinds.[58] The cost of expansion was estimated at $96,000. A complete granulating plant was planned for construction at Blantyre.

MALI [59]

The mineral industry of the Republic of Mali contributed minor value to the economy as represented by the gross national product (GNP) estimated at $297 million [60] in 1971. The National Society for Research and Mineral Exploration (SONAREM), a Government of Mali agency, carried out mineral exploration and evaluation studies of deposits in several areas. Bureau de Recherches Géologiques et Minières (BRGM), a French organization, and the Péchiney Co. were studying bauxite deposits in western Mali. Reserves of 820 million tons of bauxite with a 40 percent alumina (Al_2O_3) content and up to 4 percent silica were reportedly available. The United Nations Development Program (UNDP) was helping to strengthen the Government Services for Ground Water Exploration and Development. At the beginning of 1971, the UNDP had spent a total of $853,600 on the project, which was scheduled for completion at yearend. An important discovery of water was made by a UNDP well drilling team in the arid border area near Mauritania.

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[58] Standard Bank Review (London). Malawi. April 1971, p. 20.

[59] Henry E. Stipp, physical scientist, Division of Ferrous Metals.

[60] Where necessary, values have been converted from Malian francs (MF) to U.S. dollars at the rate of MF550=US$1.00.

The Agency for International Development, a U.S. Government organization, was funding an experimental program in Mali to determine the possible usefulness of data obtained from various space photographic missions. The Government published a new mining code, Ordinance No. 34 CMLN, that covered the exploration, exploitation, transportation, and refining of mineral and fossil fuel substances other than liquid and gas hydrocarbons. Exploration for radioactive substances conducted by a West German team and the Government of Mali continued in the area north of Kita. The Liptako-Gourma Authority, a political organization set up by Mali, Upper Volta, and Niger to develop the area between Gao, Ouagadougou, and Niamey, passed a general resolution establishing research and development of mineral deposits as one of its main priorities.

Production of mineral commodities was confined to output of marble, limestone, salt, gold, and the manufacture of cement. Foreign trade in mineral commodities in 1970 consisted mainly of the import of petroleum products valued at $4.1 million and iron and steel products valued at $2.8 million.[61] There were few exports of mineral commodities. Statistics on production and foreign trade in mineral commodities are shown in table 19.

Reportedly, SONAREM was evaluating gold deposits discovered as a result of a study of indices obtained from a mineral prospecting survey. SONAREM also was exploring in the Senegal River basin of the Kayes-Koulikoro area where about 500 million tons of iron ore (hematite and goethite) were discovered. Manganese deposits in the Ansongo area were scheduled for study by SONAREM. Reserves in this area have been estimated at 3.5 million tons of ore. Pegmatite deposits containing spodumene ore, in the Sikasso-Bougouni area, were surveyed by geochemical prospecting. Reserves have been estimated at 300,000 tons of spodumene, with a 6.7-percent lithium oxide content.

Deposits of phosphate rock in the Tilemsi Valley of eastern Mali have been estimated at 20 million tons containing 28 to 34 percent phosphorous pentoxide (P_2O_5).

An aerial survey of the Texaco, Inc., concession area in northern Mali and western Mauritania was conducted by Aero Services Corp., Inc., a United States firm.

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[61] Government of Mali, General Statistical Service. Statistiques Douanières du Commerce Extérieur. 1970.

Table 19.—Mali: Foreign trade in mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
EXPORTS		
NONMETALS		
Salt	590	1,072
MINERAL FUELS AND RELATED MATERIALS		
Petroleum refinery products	4,677	4,774
IMPORTS		
METALS		
Aluminum and alloys, all forms	103	174
Copper and alloys, all forms	54	24
Iron and steel including alloys, metal, semimanufactures	5,677	6,206
Lead and alloys, all forms	16	--
Tin and alloys, all forms ... long tons	4	2
Zinc and alloys, all forms	6	62
NONMETALS		
Cement, hydraulic	22,600	13,318
Fertilizers manufactured	4,965	3,450
Salt	17,510	15,929
Stone, sand and gravel	233	54
MINERAL FUELS AND RELATED MATERIALS		
Petroleum refinery products	69,645	71,671

MAURITANIA[62]

The mineral industry of Mauritania contributed significantly to the economy of the country in 1971. Taxes from production and export of iron ore normally provide about one-third of the total Government revenue. Exploration for mineral and petroleum deposits continued to expand. The Government provided $10 million in the second 4-year plan (1970–73) for the promotion of mineral exploration and development. A new investment code that offers very favorable terms for foreign investors was approved by the National Assembly in January. Mining companies are among the enterprises qualifying for tax and import duty exemptions. Bureau de Recherches Géologiques et Minières (BRGM) obtained a permit to explore for various metal ores, including copper, in the Bou-Zraibie region south of Oum Kadnar. The French company Kuhlmann was studying the possibility of mining ilmenite sands, recently discovered in the coastal region.

Reportedly many indications of chromite and beryllium were discovered in the Amsaga area and the Adrar and Inchiri regions. Two permits to explore for petroleum in a 40,144- and 210,756-square-mile area, respectively, in the Lebassier-Taoudeni region of southeast and east-central Mauritania were awarded to Agip Recherches et Exploitation S.p.A. Other mineral exploration projects included a survey in a 38,600-square-mile area in northeastern Mauritania near Reguibat, and a survey for copper and other metal ores in the Tasiast region. A mineral exploration survey also was planned for the Atar and Nodh regions. Shell Mauritania Oil Co. was negotiating with the Government for a concession along the coast in an area between the 656-foot and 6,562-foot depths of water. The Government was preparing legislation to extend the country's offshore jurisdiction for oil concession purposes.

Production of iron and copper ore in 1971 was valued at about $85.3 million.[63] Output of iron ore decreased 7.1 percent from that of 1970 because of a reduced demand in world markets and a 2-month plant shutdown. Copper ore production did not attain the expected growth rate because of production problems at the new plant. Unrecorded quantities of salt, gypsum, sand and gravel, and stone also were produced for local use. Statistics on production are shown in table 1. Foreign trade in mineral commodities consisted mainly of exports of iron ore. Shipments in 1970 went principally to France, the United Kingdom, Italy, Belgium, and West Germany. Imports of mineral commodities into Mauritania were confined mainly to iron and steel semimanufactures, petroleum products, cement, and fertilizer materials. Statistics on foreign trade are shown in table 20.

Société Minière de Mauritania (SOMIMA) operated its mine near Akjoujt producing 4,515 tons of ore in 1971 compared with 120,000 tons in 1970. Serious delays were experienced in putting the mine into production. The mill and Torco treatment plant were shut down several times owing to mechanical problems. Reportedly copper concentrate production, which was far below expectations, totaled 1,500 tons containing 60 percent copper and was, valued at $10 million. SOMIMA planned to increase production in 1972.

Société des Mines de Fer de Mauritanie (MIFERMA) suffered its first decrease in iron ore and concentrate production since 1963. Output dropped to 8.5 million tons compared with 9.1 million tons in 1970. A general strike by Mauritanian workers in September and October, together with slack demand for iron ore in world markets was mainly responsible for the decrease in production. MIFERMA was investigating deposits of iron ore in the hills located within 65 miles of Zouerate. Reserves in these hills have been estimated roughly at 2 billion tons of ore having an average iron content of 37 percent. The complexity of the ore will require more study and installation of a pilot plant for treatment of the ore.[64] MIFERMA planned to complete the survey by 1975. If economic studies of the hill deposits are favorable, the company will build a beneficiating plant to produce 4.5 million tons of high-grade concentrate annually.[65]

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[62] Henry E. Stipp, physical scientists, Division of Ferrous Metals.

[63] Where necessary, values have been converted from Communauté Financière Africiane Francs (CFAF) to U.S. dollars at the rate of CFAF250=US$1.00.

[64] Mining Journal Miferma. V. 277, No. 7097, Aug. 27, 1971, p. 191.

Amoco Mauritania Petroleum Co. and Planet Oil Co. conducted a seismic survey in their concession area located offshore from Cape Timiris. Esso Exploration and Production Mauritania drilled an offshore wildcat well MTO 2 after abandoning well MTO 1, also offshore.[66] Texaco Mauritania Inc. conducted a seismic survey in its 57,900-square-mile concession area located in east-central Mauritania, near the Mali border. The company has exclusive rights to prospect in the area for 5 years and must spend $3 million on exploration and exploitation. Drilling operations must begin by mid-1973. Texaco planned to open an office in Nouakchott.

Table 20.—Mauritania: Apparent foreign trade in selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1969	1970
EXPORTS		
METALS		
Iron and steel:		
Ore and concentrate ...thousand tons	8,238	8,699
Roasted iron pyrites	[2] 20,689	20,839
Scrap	2,115	--
NONMETALS		
Fertilizer materials, crude and phosphatic	10,520	--
Nonmetallic minerals, crude n.e.s	270	--
IMPORTS		
METALS		
Copper and alloys, semimanufactures	14	20
Iron and steel semimanufactures	5,974	4,689
Tin and alloys, unwrought ...long tons	12	8
NONMETALS		
Abrasives, grindstones	48	25
Cement, hydraulic	3,285	3,286
Clay products:		
Refractory	609	171
Nonrefractory	523	168
Fertilizer materials, manufactured:		
Nitrogenous	2,841	3,240
Other, n.e.s	--	2,330
Salt	4,800	3,295
MINERAL FUELS AND RELATED MATERIALS		
Petroleum refinery products:		
Gasoline ...thousand 42-gallon barrels	17	21
Kerosine ...do	9	8
Distillate fuel oil ...do	264	339
Lubricants ...do	20	27

[1] Compiled from trade statistics for selected trading partner countries, in the absence of official Mauritanian trade returns.

[2] Reported in Spanish import statistics; no output of roasted pyrite is credited to Mauritania.

Source: Statistical Office of the United Nations, 1969 and 1970 editions of Supplement to the World Trade Annual. V. 3 (Africa), published by Walker and Co., New York, 1971 and 1972.

MAURITIUS[67]

The mineral industry of Mauritius, a 720-square-mile island in the Indian Ocean, about 500 miles east of Malagasy, contributed minor value to the economy in 1971. The Governments of Mauritius and France agreed on a plan to construct a petroleum refinery on the nearby island of Réunion and to export petroleum products to Mauritius. Fertilizer from a plant on Mauritius in turn would be exported to Réunion.[68] Production of mineral commodities consisted of about 6,000 tons of coral, used mainly in the manufacture of lime for consumption by the sugar industry. About 4,000 tons of salt were recovered from sea water solar evaporation plants. Unrecorded quantities of stone and sand and gravel were produced for road and building construction. Foreign trade in mineral commodities in 1970 consisted of imports of petroleum products valued at $5.4 million, nickel imports valued at $214,286, and copper imports valued at $107,143.[69] Fertilizer materials also were imported. There were no exports of mineral commodities.

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[65] Skillings' Mining Review. Miferma Project. V. 60, No. 30, July 24, 1971, p. 8.

[66] World Petroleum Report. Mauritania. V. 18, 1972, p. 73.

[67] Henry E. Stipp, physical scientist, Division of Ferrous Metals.

[68] Barclays International Review (London). Mauritius. December 1971, p. 16.

A steel plant capable of producing 250,000 tons per year of semimanufactures reportedly was scheduled for construction on Mauritius.[70] The plant will be financed by Indian and West German interests. Iron ore for the plant will be imported from neighboring sources and all products will be exported. An estimated 20,000 new permanent jobs will be created by the project.

Construction of a proposed fertilizer plant in the Port Louis harbor area was delayed in 1971, pending studies of the pollution effect of dust emission from the plant.[71] At yearend the problem had been solved and the plant was scheduled for construction in the same area in 1972. The plant of Mauritius Chemical and Fertilizer Industry Ltd. will be capable of producing 120,000 tons of fertilizer annually. Domestic consumption of 60,000 tons per year and consumption of 40,000 tons per year in neighboring Réunion Island would leave 20,000 tons per year available for export.

Texaco Mauritius, Inc., conducted seismic surveys mainly in the Saya de Malha bank area. Preliminary results reportedly were not encouraging. At yearend the French firm Kalor planned to start producing oils and lubricants on Mauritius in 1972. The products will be consumed in Mauritius and exported to Réunion, Malagasy, and the Republic of South Africa.[72]

Table 21.—Mauritius: Apparent foreign trade in mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1969	1970
EXPORTS		
Copper and alloys, scrap	340	337
Other nonferrous metal, scrap	48	174
IMPORTS		
Aluminum metal and alloys, unwrought and semimanufactures	29	73
Cement, hydraulic	--	329
Clay products:		
Nonrefractory	--	560
Refractory	368	414
Copper metal and alloys, unwrought and semimanufactures ... value, thousands	$37	$41
Fertilizer materials, manufactured:		
Nitrogenous	1,427	2,955
Potassic	3,569	3,733
Mixed	25,776	18,343
Iron and steel:		
Steel, primary forms	296	1,607
Semimanufactures	4,320	9,635
Nonferrous metals and alloys, unwrought and semimanufactures, n.e.s. value, thousands	$25	$29
Petroleum refinery products:		
Gasoline ... thousand 42-gallon barrels	9	32
Kerosine ... do	40	51
Distillate fuel oil ... do	32	81
Lubricants ... do	1	1
Precious and semiprecious stones, except diamond ... value, thousands	$83	$118

[1] Compiled from trade statistics of selected trading partner countries.

Source: Statistical Office of the United Nations, 1969 and 1970 editions of Supplement to the World Trade Annual. V. 3 (Africa), published by Walker and Co., New York, 1971 and 1972.

NIGER [73]

The mineral industry of the Republic of Niger was highlighted by the start of production in February of uranium concentrates at the processing facility of Société des Mines de l'Air (SOMAIR) at Arlit. Small quantities of tin, gold, and assorted construction materials accounted for the remaining mineral commodities produced.

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[69] Where necessary, values have been converted from Mauritius Rupees (MR) to U.S. dollars at the rate of MR5.6=US$1.00.

[70] Industries et Travaux d'Outremer. Ile Maurice. No. 218, January 1972, p. 80.

[71] U.S. Embassy, Port Louis. State Department Airgram A-128, July 28, 1972, 2 pp.

[72] Barclays International Review (London). Mauritius. November 1971, p. 16.

[73] James S. Kennedy, industry economist, Division of Nonferrous Metals.

Exploration, financed primarily by the United Nations Development Fund (UNDF) and four U.S. oil companies, continued with encouraging results although no discoveries of exploitable deposits were reported. Total value of mineral production is not available but is apparently of minor significance compared with other sectors of the economy. Foreign trade consisted mainly of exports of uranium and tin concentrates. Principal imports were iron and steel semimanufactures and petroleum refinery products.

The small quantity of gold was produced by traditional placer methods from alluvial deposits in the Sirba Valley. Production of tin by Société Minière du Niger (SMDN) from alluvial deposits near Agadès increased 19 percent over that of the previous year. Metal content increased less than 2 percent, however, due to the mining of lower grade ore. Concentrates are shipped to Nigeria and Belgium for smelting. The total labor force of SMDN at yearend was about 446. Production of cement from the country's single plant at Malbaza declined 32 percent from the record output of the previous year. Annual capacity of the plant is 45,000 tons, and employment is estimated at 150. Gypsum is mined to meet the requirements at Malbaza and for export to the Sokoto cement plant in Nigeria.

SOMAIR completed first-stage mill construction at its Arlit uranium mine early in the year, and the facility was inaugurated in December. Annual capacity of the plant is 750 tons U_3O_8 with provisions for expansion to 1,500 tons per year by 1974. The depressed world uranium market and amount of investment required, however, may lead to postponement of current expansion of plans. Operating costs are high due to the remote location of the mine and the necessity of transporting all supplies, including more than 25,000 tons of diesel fuel and chemicals per year, over a 1,300-mile rail and truck route from Cotonou in Dahomey. Transportation costs add about $2 per ton to the cost of Arlit uranium delivered in Europe.[74] Interests in SOMAIR are held by the French Commissariat à L'Énergie Atomique (CEA), 33.5 percent; the Government of Niger, 16.75 percent; Péchiney-Mokta Mining Co. (France), 18.84 percent; Compagnie Fran-

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[74] Where necessary, values have been converted from Communauté Financière Africaine Francs (CFAF) to U.S. dollars at the rate of CFAF275=US$1.00.

Table 22.—Niger: Apparent foreign trade in selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1969	1970
EXPORTS		
METALS		
Aluminum, bauxite	[2] 15,935	--
Tin, ore and concentrate ... long tons	115	27
IMPORTS		
METALS		
Aluminum and alloys, all forms	--	40
Iron and steel, semimanufactures	4,910	5,508
Nonferrous metals, n.e.s ... value, thousands	$28	$28
NONMETALS		
Cement	NA	1,440
Clay products, nonrefractory	167	NA
Fertilizer materials, manufactured ... value, thousands	$37	$44
Nonmetallic mineral manufactures, n.e.s	16	67
MINERAL FUELS AND RELATED MATERIALS		
Petroleum refinery products:		
Gasoline ... thousand 42-gallon barrels	52	181
Kerosine ... do	46	58
Distillate fuel oil ... do	28	88
Residual fuel oil ... do	90	187
Lubricants ... do	7	6

NA Not available.

[1] Compiled from trade statistics for selected trading partner countries in the absence of official Niger trade returns.

[2] Reported in Italian import statistics; no output of bauxite is credited to Niger.

Source: Statistical Office of the United Nations, 1969 and 1970 editions of the Supplement to the World Trade Annual. V. 3 (Africa), published by Walker and Co., New York, 1971 and 1972.

çaise des Minerais d'Uranium, 14.66 percent; Urangesellschaft A.G. (West Germany), 8.125 percent; and Agip Nucleare (Italy), 8.125 percent. Total investment, including the cost of the processing plant power-generating units, living quarters, and mining equipment is estimated at $50 million.[75]

The Akokan uranium deposit, located about 20 kilometers south of Arlit, was under development by joint Government of Niger, CEA, and Overseas Uranium Resources Development Co. (Japan) interests. The first stage of exploration was completed, and a second stage for 1971–72 was being planned. The ore deposit lies at a depth of about 100 meters and will be mined by underground methods. Reserves are estimated at 30,000 tons U_3O_8. An operation of the same magnitude as that at Arlit (maximum 1,500 tons U_3O_8 per year) is planned.

A third uranium deposit, at Imouraren, along the same mineralized zone 50 kilometers south of Arlit, was under investigation. Uranium ore was intersected by drilling at depths of 150 to 400 meters.

The 4-year UNDF mineral survey project, which started in 1967, was scheduled for completion in March. Although no discoveries of exploitable deposits were found, results of concluded surveys indicated several areas which justify additional study. A 2-year, $1.5 million program was planned to further evaluate the Liptako, Kourki, and Aïr Mountain areas.

A survey team from Japan planned to conduct a series of geological surveys of copper deposits located 250 kilometers northeast of Niamey. Essex Iron Co., a subsidiary of United States Steel, conducted geochemical sampling in designated zones of three permit areas. At yearend a geophysical program was undertaken in the Makalondi region. Bishop Oil and Refining Co. announced an exploration program for diamonds in the Aïr Mountain region.

In the petroleum sector, Mandrel Industries completed a seismic survey in June for Texaco Niger, Inc., in its 245,000-square-kilometer concession in eastern Niger. Continental Overseas Oil Company (CONOCO) began an aeromagnetic survey at its 290,000-square-kilometer concession in the southern part of the country. Bishop Oil & Refining Co. and Global Energy Co. continued surveys initiated in 1970 in their respective concession areas. In February Libya and Niger agreed to cooperate in a joint exploration program in areas surrounding their common border.

RWANDA[76]

No major mineral developments were reported in Rwanda in 1971. A new mining law was passed aimed at encouraging new investment in mineral production. The Woods Hole Oceanographic Institute, Woods Hole, Mass., completed its study and submitted a preliminary report to the Rwandan Government on the geology, biology, and ecology of Lake Kivu. An estimated 32 million metric tons of methane, renewed every 100 years, exist 300 feet below the lake. It was thought that petroleum might exist in geologic traps in the northern basin.

Table 23.—Rwanda: Apparent foreign trade in selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1969	1970
EXPORTS		
Tin ore and concentrate ---- long tons	1,044	1,235
Tungsten:		
Ore and concentrate	309	293
Metal, all forms	--	10
IMPORTS		
Iron and steel semimanufactures	2,198	4,639
Petroleum refinery products	180	166

[1] Compiled from trade returns of 24 trading partner countries given in Statistical Office of the United Nations, 1969 and 1970 editions of Supplement to the World Trade Annual. V. 3 (Africa), published by Walker and Co., New York, 1971 and 1972.

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[75] U.S. Bureau of Mines. Mineral Trade Notes. V. 69, No. 6, June 1972, p. 28.

[76] V. Anthony Cammarota, Jr., physical scientist, Division of Nonferrous Metals.

Minerals are Rwanda's second most important source of foreign exchange after agricultural products. In 1970, mineral exports were valued at about $8 million, compared with a total of about $24 million for all exports.

Cassiterite continued to be the chief mineral produced and exported. Cassiterite production in 1971 was valued at an estimated $3.9 million, down from $4.1 million in 1970. Tungsten production was valued at an estimated $1.9 million in 1971, compared with $1.6 million in 1970.

SENEGAL [77]

Significant mineral production in the Republic of Senegal is limited to the production of phosphate rock and fertilizer products. In addition, cement is manufactured, petroleum is refined, and small quantities of salt, building stone, and attapulgite (fuller's earth) were produced for domestic consumption and export.

Senegal has a single cement plant at Rufisque owned by the Société Ouest Africaine des Ciments. It is a dry-process plant, with two kilns operating in 1965 and another one added probably since that time. Production from this plant, although small by world standards and for Senegal, was raised from 206,900 tons in 1969 to 241,000 tons in 1971. During the last few years, Senegal has exported about 30,000 tons of cement per year to neighboring countries such as Mali and Mauritania.

Oil prospecting by several international companies, although continuing, has not located exploitable quantities. Senegal operates its own petroleum refinery at M'Bao near Dakar and supplies most of the country's needs.

The Société Africaine de Raffinage (SAR), Dakar, operates a 12,600-barrel-per-day refinery at M'Bao, near Dakar which started operating in 1963.

A 4,500-barrel-per-day electrofiner project is planned by Elf Union that may, if constructed, be onstream in 1973.

Shell Sénégalaise de Recherches et d'Exploitation started drilling in an offshore and onshore southern Senegal concession awarded in 1971. Compagnie des Petroles Total Afrique de l'Ouest (COPET-AO) /C.P.C. drilled and abandoned five Casamance offshore concession wildcat wells. Two wells had oil shows.

Preliminary reports indicate that iron ore assaying over 60 percent Fe has been located in southeastern Senegal; however, without transportation to ports, development programs are not planned at this time. Traces of copper and chrome have been located by United Nations exploration activities but additional work will be required to determine the size and commercial feasibility of these deposits.

Two companies mine phosphate deposits in Senegal. Compagnie Sénégalaise des Phosphates de Taiba (CSPT) mines calcium phosphate and the Société Sénégalaise des Phosphates de Thiès produces natural aluminum phosphates.

The Taiba Co. deposits, located approximately 70 miles from Dakar, near the town of Tivaouane were initially mined in 1960. The plant capacity in 1960 was 600,000 tons and was increased to 1.1 million tons in 1969. The phosphate seam has an average thickness of 21 feet under a sand overburden varying from 50 to 80 feet. Proven reserves have been estimated at some 40 million tons.

Production increased at Taiba from 998,000 tons in 1970 to 1,398,000 tons in 1971, an increase of 40 percent. The production was valued at approximately US$17,231,809 or US$12.34 per ton of concentrates averaging 37.8 percent P_2O_5. Approximately 84 percent of this production was exported. Of the total exported, Great Britain received 26.3 percent; France, 25.6 percent; the Netherlands, 16.1 percent; Japan, 9.4 percent; and smaller quantities were shipped to West Germany, Finland, Greece, India, Italy, Lebanon, Portugal, and Sweden.

The Société Sénégalaise des Phosphates de Thiès, a subsidiary of the Péchiney-St. Gobain group, mines a natural aluminum phosphate deposit, approximately 6 miles north of Thiès. Production increased from 175,430 tons in 1970 to 194,457 tons in 1971. The products with production in 1970 and 1971, in metric tons, and percent change are shown in the following tabulation:

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[77] William F. Stowasser, physical scientist, Division of Nonmetallic Minerals.

	1970	1971	Change, per cent
Natural aluminum phosphate rock	130,388	146,632	+12.5
Dried phosphate rock	38,323	45,737	+19.3
Phosphal and Polyfos	5,985	1,907	−68.1
Baylifos	734	181	−75.3
Total	175,430	194,457	+10.8

The bed of phosphate varies in thickness from 0 to 13 feet, is low in fluorine content, and for this reason is suitable for animal feed supplements. The future exploitation of these deposits is dependent on the development of markets for aluminum phosphates that average about 30 percent P_2O_5.

The majority of the aluminum phosphate rock, 100,672 metric tons, was exported to France as were 43,875 metric tons of dried phosphate rock.

The value assigned to the aluminum phosphates totaled US$2,262,894 or an average of US$11.64 per ton.

The total production of both calcium phosphate and aluminum phosphates and processed products was 1,592,632 tons, a significant increase of 36 percent from the 1970 production level.

Table 24.—Senegal: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Copper metal and alloys, unwrought and semimanufactures	721	830
Iron and steel:		
Scrap	6,598	9,341
Semimanufactures	391	689
Lead metal and alloys, unwrought and semimanufactures	298	266
Tin:		
Ore and concentrates ... long tons	36	NA
Zinc metal and alloys, unwrought and semimanufactures	17	NA
Other, unspecified metalloids	2	10
NONMETALS		
Cement, hydraulic	25,608	70,837
Chalk	10	NA
Clays, crude	1,172	2,654
Fertilizer materials:		
Crude, calcium phosphate	793,642	955,919
Manufactured:		
Nitrogenous	169	14
Phosphatic	48,456	48,888
Mixed	3,064	7,617
Ammonia	--	3
Gypsum	83	2,004
Salt	45,362	106,752
Sand and gravel	34	NA
Sodium and potassium compounds n.e.s	496	56
Stone dimension, worked	64	1
Sulfur, elemental	65	NA
MINERAL FUELS AND RELATED MATERIALS		
Petroleum refinery products:		
Gasoline ... thousand 42-gallon barrels	71	30
Kerosine ... do	245	498
Distillate fuel oil ... do	249	399
Residual fuel oil ... do	421	115
Lubricants ... do	2	20
Liquefied petroleum gas ... do	14	69
Other ... do	(1)	8
Total ... do	1,002	1,139

NA Not available.

[1] Less than ½ unit.

Table 25.—Senegal: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum:		
Oxide and hydroxide	2	--
Metal and alloys, all forms	650	386
Copper metal and alloys, all forms	101	111
Iron and steel:		
Scrap	211	418
Pig iron and ferroalloys	34	7
Steel, primary forms	4	NA
Semimanufactures	63,905	57,283
Lead:		
Oxide	44	61
Metal and alloys, all forms	31	11
Mercury 76-pound flasks	116	58
Nickel metal and alloys, all forms	3	2
Silver metal and alloys, unwrought and semimanufactures value, thousands	$10	$88
Tin, metal and alloys, all forms long tons	15	12
Titanium oxide	175	160
Zinc:		
Oxide	76	43
Metal and alloys, all forms	26	22
Other:		
Metalloids n.e.s	11	7
Nonferrous metals and alloys, all forms	1	4
NONMETALS		
Abrasives, crude natural, except diamond	--	1
Asbestos	474	799
Barite and witherite	109	925
Borates:		
Crude, natural	3	--
Cement, hydraulic	2,707	2,395
Chalk	961	1,245
Clays and products:		
Clays, crude	1,651	6,300
Products:		
Nonrefractory	1,411	729
Refractory	448	869
Diatomaceous earth	37	29
Fertilizer materials:		
Manufactured:		
Nitrogenous	2,518	1,614
Phosphatic	--	7
Potassic	1,516	8,027
Mixed	23	NA
Ammonia	4,051	7,441
Gypsum	9,144	5,344
Lime	1,697	1,230
Mica, crude and worked	53	NA
Pigments, mineral:		
Natural	155	183
Iron oxide, manufactured	45	98
Salt	115	80
Sodium and potassium compounds n.e.s:		
Sodium hydroxide	4,884	4,677
Potassium hydroxide, sodium and potassium peroxide	24	13
Stone, sand and gravel:		
Dimension stone, crude and worked	261	35
Dolomite, industrial	112	40
Quartz and quartzite	69	71
Crushed and broken stone and gravel n.e.s	229	525
Sand, not metal bearing	6	38
Sulfur, elemental, all types	6,320	12,932
Talc and related materials	205	155
MINERAL FUELS AND RELATED MATERIALS		
Asphalt, natural	161	NA
Carbon black	1	3
Coal and coal briquets	172	260
Coke	139	159
Petroleum:		
Crude thousand 42-gallon barrels	6,174	3,774
Refinery products:		
Gasoline do	17	26
Kerosine, and jet fuel do	1	1
Distillate fuel oil do	4	3
Residual fuel oil do	(1)	NA
Lubricants do	39	48
Other do	52	61
Total do	113	139
Crude chemicals from coal, oil and gas distillation	501	541

NA Not available.

[1] Less than ½ unit.

SOMALI REPUBLIC[78]

The mineral industry of the Somali Republic contributed minor value to the economy of the country in 1971. Salt was recovered by solar evaporation methods and meerschaum was quarried for preparing souvenirs by local artisans. Unrecorded quantities of stone, sand, and gravel were produced for local construction. Activity related to minerals consisted of exploration by specialists from the United Nations, the Government of Somalia, foreign governments, and private industry. A 12-man mineral exploration team from the People's Republic of China (PRC) and two Somali mineral experts were surveying for minerals, water, and petroleum. A West German planning group recently began a water survey which will be conducted throughout the country. An agreement whereby Bulgaria will make a loan of $1.5 million[79] to Somalia for exploration of cassiterite (tin ore) deposits in the Madjian area of the Las Khoreh region was signed in January. At yearend it was reported that a Bulgarian group would exploit tin deposits in the Las Khoreh region.

Nucleare Somala (SOMIREN), a subsidiary of Ente Nazionale Idrocarburi (ENI) of Italy conducted exploration and evaluation studies of uranium deposits.

Economic evaluation studies on the location of a cement plant were conducted by a joint Somali-North Korean committee. The plant will be constructed by North Korea in 1972 at Berbera or Mogadiscio.

The discovery of marble and granite deposits in the Bur Acaba area was reported at yearend. The deposits were said to be of high quality and sufficient in size to supply stone for export. Some quarrying has occurred at the deposits, but there is no indication that the materials have been exported.

In August ELF-SOMALIA, a subsidiary of the French ELF-ERAP petroleum organization, was granted a 7,145-square-mile concession area along the northeastern Somali coast. Exploration work was scheduled to begin by yearend. Hammar Petroleum Co., which has a 14,700-square-mile concession in the southwest, and Burmah Oil Somalia Ltd. conducted seismic exploration work. The existence of at least one structure was confirmed and exploration work was continuing to confirm the presence of other structures. The firms planned to begin drilling in mid-1972.[80] ELF-Scebel notified the Government of its intention to abandon its concession in central Somalia. Two United States oil companies, Continental Oil Corp. and Esso Exploration, Inc., have submitted applications for exploration concessions.

A group of Soviet specialists reportedly was interested in exploring for deposits of piezoelectrical quartz in the mountainous area between Hargeisa and Berbera. The Soviets also will conduct exploration for other minerals in the same area. The United Nations Development Program (UNDP) continued detailed exploration on selected uranium occurrences in Mudugh Province, evaluated pegmatities in northern Somalia, conducted geochemical exploration in the North and drilled water wells in the areas of Benadir, Upper Juba, Hiran, and Mudugh. The UNDP also strengthened Somalia's Geological Survey by awarding fellowships, and by on-the-job training.

Data were not available on production of minerals in 1971. However, based on output in previous years, about 2,000 tons of salt, 4,000 tons of Sepiolite (meerschaum), and unrecorded quantities of stone, sand and gravel were produced. Foreign trade in mineral commodities consisted mainly of imports of petroleum products, iron and steel semimanufactures, cement, and fertilizer materials. A small quantity of iron and steel semimanufactures were reexported. Statistics on foreign trade are shown in table 26. In October the National Petroleum Co. of Somalia and the Somali Petroleum Agency signed an agreement with the Soviet trading firm, Soyuzkhim Export Agency, for the import into Somalia in 1972 of $2.8 million of petroleum products. The Somalia Government also signed a trade agreement with Iraq for the import into Somalia of lubricants and light petroleum oils.

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[78] Henry E. Stipp, physical scientist, Division of Ferrous Metals.

[79] Where necessary, values have been converted from Somali shillings (Ss) to U.S. dollars at the rate of Ss7.14=US$1.00.

[80] World Petroleum Report. Somalia. V. 18, 1972, pp. 74, 75.

Table 26.—Somali Republic: Foreign trade in mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
EXPORTS		
METALS		
Nonferrous metal scrap	r 308	125
Copper metal and alloys, semimanufactures	50	NA
NONMETALS		
Salt	71	NA
MINERAL FUELS AND RELATED MATERIALS		
Petroleum refinery products thousand 42-gallon barrels	(1)	NA
IMPORTS		
METALS		
Iron and steel:		
Pig iron and ferroalloys	2	16
Primary forms	32	65
Semimanufactures:		
Bars, rods, angles, shapes, sections	1,579	1,146
Universals, plates, sheets	2,091	3,248
Hoop and strip	1	--
Rail and accessories	1	512
Wire	492	229
Tubes, pipes, fittings	697	435
Castings and forgings	187	39
Nonferrous metals unwrought and semimanufactures:		
Aluminum and alloys	70	36
Copper and alloys	62	7
Lead and alloys	1	4
Platinum and silver thousand troy ounces	64	1,125
Tin and alloys long tons	1	77
Zinc and alloys	79	163
NONMETALS		
Cement, hydraulic	32,042	17,197
Clay products, refractory	288	722
Fertilizer materials:		
Crude	171	104
Manufactured	7,315	3,360
Stone, sand and gravel	128	108
Other crude minerals	2,605	3,563
MINERAL FUELS AND RELATED MATERIALS		
Petroleum refinery products	66,724	71,815
Crude chemicals from the distillation of coal, gas, or oil	2,065	630

r Revised. NA Not available.

[1] Less than ½ unit.

SOUTHERN RHODESIA [81]

The importance of Rhodesia as a mineral producing country has continued to increase during the past few years despite economic sanctions applied by the United Nations over the Unilateral Declaration of Independence (UDI) of November 1965. As a result of the sanctions, Rhodesia embargoed mining news particularly for operations, production, and trade data.

Value of Rhodesian mineral output rose for the eighth successive year, increasing from $138.1 million [82] in 1970 to $141.7 million in 1971. The Minister of Mines reported that Rhodesian mineral production exceeded R$100 million for the first time in history despite adverse world markets. Also, according to the Minister of Mines, mineral output has risen 58 percent compared with that of 1965.

An important feature of recent developments was the extent of growth in both volume of production and local mineral processing. This was reflected by increased electrical consumption by the mineral industry; much of the increase was a direct result of mineral processing.

Prospecting activities in Rhodesia were unaffected by world events during 1971 as 42 new prospecting orders were granted involving an expenditure of $4.2 million. Various mining concerns were actively engaged in prospecting, primarily for copper, nickel, precious metals, and chromite. Reportedly, the Rhodesian Government issued two special concessions for exploration of liquid hydrocarbons. One concession area in the Lowveld area near the Mozambique border was said to cover 253 square miles. At yearend, 65 exclusive prospecting orders covering 7,826 square miles were in effect.

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[81] John L. Morning, supervisory physical scientist, Division of Ferrous Metals.

[82] Where necessary, values have been converted from Southern Rhodesian dollars to U.S. dollars at rate of R$1.00=US$1.40.

The Gold Mining Act (financial assistance) originally passed by Parliament in 1963 and extended in 1968 and 1970, was further extended to August 31, 1973. The act provides assistance to dying gold mines (mines in the last stages of production or subeconomic mines). In 1971, mines receiving assistance were Vubachikwe, Dawn, Freda, Penzance, Turtle, Pickstone, and Marvel.

To alleviate the shortage of rail capacity, the Minister of Commerce announced a road haulage plan for finished cement and certain raw materials used in cement manufacture. Bulawayo and Collen Bawn are the main production centers, whereas most of the demand comes from the northern part of Rhodesia. A levy of 16.7 cents per 50-kilogram sack of cement was imposed on all cement sales, except for those sales within a 10-mile radius of the Bulawayo General Post Office. The levy, which applied to all types of Portland cement, was to meet additional transportation costs and was not to be absorbed into manufacturers operating revenue.

The Minister of Commerce in May announced an end to rationing of petrol (automobile fuel) having determined that rationing was no longer having a significant effect on consumption. As a result, for the first time in 5 years, Rhodesian motorists were able to purchase petrol without ration coupons.

The Metrication Council approved recommendations that after April 1 cement and fertilizer would be produced in metric packs. Standard packaging for cement was established at 50 kilograms and for fertilizers at 10, 20, and 50 kilograms.

COMMODITY REVIEW

Historically five mineral commodities (in order of importance), namely gold, asbestos, coal, chromite, and copper, accounted for 95 percent of total Rhodesian mineral production. In 1965 these same minerals were responsible for 88 percent of mineral value output, but the order of importance was asbestos, gold, copper, coal, and chromite. Since UDI, it is believed that asbestos has been surpassed by copper and probably by nickel with gold dropping to fourth in ranking.

Metals.—*Arsenic.*—Arsenic was recovered as a byproduct in the processing of arsenical gold concentrate at the government roasting plant in Que Que. The annual rate of output is governed by the activities of the plant and is consumed locally by African explosives and chemical industries for manufacture of insecticides and sheep dip.

Chromite.—Rio Tinto (Rhodesia) Ltd. acquired the total share capital of Rhodesian Mining Enterprises (Pvt.) Ltd. and the claims and assets of the Great Dyke Chrome Mine, all in the Great Dyke Mtoroshanga area northeast of Salisbury. An option was also secured to purchase the share capital of Frances Mines (Pvt.) Ltd. which has claims in the area.

Copper.—For a number of years copper production has been an important revenue producer to Rhodesia, and since UDI in 1965, copper production capacity has increased from about 19,000 to 30,000 tons annually in 1971.

The Messina (Transvaal) Development Company Ltd., Rhodesia's largest copper producer, reported an output of 23,302 tons of refined copper during fiscal year ending September 30, 1971. An additional 11,512 tons was produced by the company's facilities at Messina, South Africa.

The firm's Umkondo mine at Bikita, Victoria, was closed down in April because its ore reserve was exhausted. During the 1971 operating period, mine output totaled 29,000 tons of ore containing 534 tons of copper. The concentrator produced 2,698 tons of concentrate containing 549 tons of copper. It is believed that the concentrate was delivered to Messina's South African smelter for refining.

Messina's Mangula mine output totaled 1,279,000 tons of ore, grading 1.09 percent copper, which the concentrator treated in producing concentrate containing 12,769 tons of copper. An additional 615,000 tons of oxide ore was treated by leaching and 4,468 tons of copper was recovered.

The Gwai River mine of Messina's, which initiated operations in 1970, produced 184,000 tons of ore grading 1.29 percent copper. Mill treatment rate and mine output were nearly balanced as the concentrator recovered 2,278 tons of copper. The planned milling rate for 1972 was set at 216,000 tons.

At a capital expenditure cost of $11.1 million, Messina brought into production at midyear the Shackelton mine located at Alaska near Sinoia. In addition, Messina plans to bring into production, over the next several years, three new mines (Avondale, Hans, and Angwa) to work in conjunction with the Shackelton, all of which will be based on the Alaska smelter. Concurrent with phasing in of the new mines will be the phasing out of the Alaska mine because of a lack of ore reserves. Mine output of the Shackelton totaled 135,000 tons, of which about one-third came from development work. The concentrator which began operation at the beginning of July reached its target milling rate of 40,000 tons per month at the end of September. A total of 92,000 tons of ore grading 2.1 percent copper was treated in recovering 1,707 tons of copper in concentrate. The milling rate for the fiscal year of 1972 was set at 480,000 tons of ore.

Messina's oldest mine, the Alaska, produced 194,000 tons of ore grading 1.31 percent copper. The concentrator which operated on mine-run and stockpiled ore treated 290,000 tons of ore grading 1.10 percent copper and produced 2,553 tons of copper in concentrate. Although the ore reserve for the Alaska mine increased slightly during the year, the mine will close as the reserve is nearing exhaustion. Ore reserves of Messina's Rhodesian mines are as follows:

Mine	Proved ore reserves	
	Tons	Copper, percent
Alaska	397,000	1.95
Shackleton	570,000	2.36
Mangula:		
Sulfide ore	15,664,000	1.31
Oxide ore	1,250,000	.73
Gwai River	152,000	1.32

South African Manganese Ltd. secured an option on the Arnoldine section of the Inyati copper-bearing reef, the balance of which is owned by the Corsyn Consolidated Mines Ltd. The section is below the Arnoldine Mission owned by the United Methodists of America.

Coronation Syndicate, a Lohnro group subsidiary, revealed that a smelter initiated operations at Inyati in 1970 in conjunction with its copper-silver property. A refinery was also commissioned. Sales for the mine totaled 3,700 tons of copper and 2,200 kilograms of silver. Coronation also planned to increase production by 40 percent, to 31,500 tons of ore treated per month. As a result of exploration at depth, ore reserves were increased to 843,000 tons grading 2.31 percent copper.

Gold.—Rhodesia's major gold mining area is the Gatooma District southwest of Salisbury, where Rio Tinto (Rhodesia) Ltd. and Falcon Mines Ltd. operated the Cam and Motor and Dalny mines, respectively. With the closure of the Cam and Motor mine, the nation's largest producer in 1965, value of Rhodesia gold production has decreased significantly.

As a result of the Government's decision to close the roasting plant at Que Que, several mines initiated operations of treating plants. The R.A.N. mine at Bindura started operations in August and initial results were satisfactory. Subsequently, problems were encountered and assistance by government metallurgists helped to bring recoveries to over 90 percent by yearend.

The Joyce mine operated by Norman Leven Gold Mines (Pvt.) Ltd. at Beatrice resumed operations after being closed for over 20 years. A concentrator also came into service and government metallurgists assisted in solving initial problems encountered.

Nickel.—Since UDI, Rhodesia made major strides in nickel production which rose from about 780 tons in 1965 to an estimated 11,600 tons in 1971. The Trojan mine operated by Trojan Nickel Mine (Pvt.), Ltd., south of Bindura began operations in 1965. Since 1968, the mine has been operating at the rate of 50,000 tons of ore per month. Ore reserves have been reported at 9.5 million tons grading 0.95 percent nickel.

The Madziwa mine, northeast of Shamva, operated by Madziwa Mines Ltd. initiated operations in June 1969. The ore reserve at the Sulfide Hill location was reported to contain nearly 5 million tons of ore grading 1.12 percent nickel and 0.25 percent copper while several miles away at Amms, an ore body was delineated that contains nearly 4 million tons of ore grading 0.95 percent nickel and 0.46 percent copper.

Production from both the Trojan and Madziwa mines, was treated by Bindura

Smelting and Refining Co. Ltd. at Bindura where refining capacity is 7,500 tons per year of 99.95 percent nickel cathodes.

Rio Tinto (Rhodesia) Ltd. continued to develop a new nickel-copper mine (Perservance) in the Chakari area. Ore reserves total about 1 million tons of ore, but grade data has not been publicized. Production from the new mine was scheduled for the first part of 1972.

The Johannesburg Consolidated Investment Co. (JCI) of the Republic of South Africa announced that a new nickel mine and smelter was planned at Shangani, Rhodesia (60 miles northeast of Bulawayo). JCI's original announcement indicated a startup in 1973, but subsequently announced a delay of 1 or 2 years, partly because of the current adverse nickel market and the need for additional geological data. Initial planned production from the mine was nearly 4,500 short tons of refined nickel annually. Reserves announced by the company are reported as sufficient for a substantial mine life, but the ore body had not been completely delineated. The grade of ore was estimated at about 0.7 percent nickel. The mine would be Rhodesia's fifth nickel producer and would bring nickel capacity to 20,000 tons annually.

Tungsten.—The Beardmore mine of the Messina (Transvaal) Development Company Ltd. produced 32,900 tons of ore containing 0.88 percent tungsten oxide (WO_3), and 2,600 tons containing 0.40 percent WO_3 was recovered from development work. An additional 3,200 tons was reclaimed from stockpiles and delivered to the mill. Hand-sorting improved the grade of ore and the gravity concentration plant recovered 355 tons of concentrate containing 234 tons of WO_3. The ore reserve was reduced to 68,000 tons grading 0.71 percent WO_3 during the year.

Nonmetals.—*Asbestos.*—Rhodesian and General Asbestos Corp. reportedly planned to spend $35 million on development of the King asbestos mine at Mashaba, about 170 miles southeast of Bulawayo. Production was expected to begin in 1972 with full capacity scheduled by yearend. Financing for the project was expected to come from profits held in Rhodesia since UDI, while much of the equipment was supplied by the domestic industry.

Barite.—Known barite deposits are fairly widespread throughout Rhodesia, but the only producing mine is that of the Dodge Mineral Production Co. (Pvt.) Ltd. at Shamoa. A drilling campaign in 1966 by Johannesburg Consolidated Investment Co. Ltd. at the Dodge mine delineated 651,000 tons of ore grading 62.8 percent barium sulfate. The Dodge mine consists of a number of small quarries and pits along a strike of 600 feet. Although adits have been driven to explore the extent of the ore deposit, all mining is confined to the quarries. The local glass industry consumes all of the mine output.

Clays.—A major Rhodesian clay product company, Clay Products Ltd., was gradually phasing out its Wankie operation and concentrating its production at Bulawayo where a $980,000 plant expansion was being constructed. The new plant will have a monthly capacity of 2,000 tons of brick. Eight down-draft kilns and a 30,000-square-foot factory were to be constructed.

Graphite.—Although graphite deposits have been known in various parts of Rhodesia, commercial exploitation was not begun until 1966 by Rho-German Graphite (Pvt.) Ltd. at the Linx mine near Urungwe in the Salisbury district. Initial production was at the rate of 4,800 tons annually.

Silica.—Industrial Sands (Pvt.) Ltd. produced silica sand from its Leek mine at Gwelo for use in glass manufacture while Union Carbide Rhomet (Pvt.) Ltd. at Que Que produced quartz, presumably for use at its ferroalloy facility. Rough and ground silica was produced at two facilities in the Salisbury district belonging to Corsyn Consolidated Mines Ltd. and Rhodesian Base Minerals Product Co. Ltd.

Mineral Fuels.—*Carbon Dioxide.*—Rhodesia Oxygen (Pvt.) Ltd. (Rhodox) officially opened a new $280,000 complex which houses the firms welding school, gas operations, technical services, workshops, and research facilities. Rhodox has long been a supplier of industrial gases to Rhodesian consumers. The new complex also pipelines carbon dioxide gas from an adjacent brewery and compresses it into cylinders for use in foundries, laboratories, and welding. A future development could lead into processing and marketing of carbon dioxide in liquid form for bulk use and as dry ice for cooling applications.

Coal.—Coal prices in Rhodesia remained static from 1962 through 1970. Effective January 1, the pithead price for all grades of washed coal rose nearly 50 cents per ton to $3.99. The price of all grades of dry coal essentially remained unchanged. The price increase reflected the need to recover costs of washing coal for a market in which the demand for special grades was growing.

Wankie Colliery Co., part of the Anglo-American group, sold 3,093,000 tons of coal during its operating year ending August 31. Coke sales of 269,000 tons reached a record high. Wankie completed a new coke oven complex which doubled its coke production capacity to 400,000 tons annually. Work on the 32 new oven facility started in 1969 and cost $11.2 million. The increased production capacity will not only satisfy the Rhodesian market, both domestic and adjacent countries, but will also enable Rhodesia to export coke to other countries.

SPANISH SAHARA [83]

The phosphate deposits in the Bu-Craa region are the principal mineral development in Spanish Sahara. Although low-grade phosphatic sediments were identified in 1947, they were not carefully investigated until 1962 when Empresa Nacional Minera del Sahara (ENMINSA), a company founded by the Spanish Government for this purpose, established by 1964 that 1 billion tons of probable phosphorite existed in the Bu-Craa area. ENMINSA proceeded to implement a program to develop the phosphate ore independently and placed contracts for the plant and associated facilities in 1969. The company was reformed in 1969 as Fosfatos de Bu-Craa S.A. (Fosbucraa) but remained a wholly-owned subsidiary of Instituto Nacional de Industria (INI).

The deposit covers an area of more than 77 square miles and the reserves have been calculated at 1,600 million tons with the grade varying from 31 to 33 percent P_2O_5. The ratio of overburden volume to ore volume will vary from 5 to 1 to as much as 10 to 1. The phosphate rock bed thickness varies from 16 to 20 feet.

Mining started in 1971. Overburden is blasted, ripped, and removed with draglines. Bucket-wheel excavators remove the ore and load 100-ton trucks which transport the ore to a crushing plant. Crushed but unbeneficiated ore is moved from Bu-Craa to the port of El Aaiun, a distance of 62 miles, by a 10-section conveyor belt. The beneficiation plant, power station and water desalination plant are located at El Aaiun. A 2-mile pier was constructed to accommodate 100,000-ton vessels in three loading berths. The plant at El Aaiun is designed to grind, wash, and dry the concentrates. The grade will be either 75 or 80 percent bone phosphate of lime (34.6 and 36.7 percent P_2O_5).

The initial capacity of the plant at El Aaiun is designed to treat 5 million tons per year of crude ore and to produce 3.3 million tons per year of concentrates. Although production started in 1971, full production is not scheduled before 1973. In addition to markets in Spain, Fosbucraa will offer Spanish Sahara phosphate to export markets throughout the world.

Although a number of international companies are prospecting for oil in offshore concessions, no commercial fields have been reported.

Empresa Nacional de Petróleos de Aragon, S.A.'s (ENPASA), marine seismic survey and wildcat well, offshore block 15–A, drilled with Société Nationale des Pétroles d'Aquitaine (SNPA) and operated by Zapata North Sea Inc. from the semisubmersible *Louisiana*, was the only active petroleum work in Spanish Sahara in 1971. The well, Alisio 15–A–1, was drilled to 12,545 feet and abandoned.

In concession changes, ENPASA was awarded four onshore permit areas; Union Carbide received five offshore licenses; and Amoco applied for three offshore concessions. The Conoco/Gulf/Cepsa group holds three onshore and three offshore permits.

SUDAN [84]

The mineral industry of Sudan contributed minor value to the economy of the country represented by the gross domestic product estimated at $1,758 million (current prices) in 1971. Activity in the minerals sector consisted mainly of mining chromite, mica, and unrecorded quantities of stone, sand and gravel; recovering salt from sea water; and manufacturing cement. Exploration for mineral and petroleum deposits by the United Nations Development Program (UNDP), Sudan Government agencies, foreign government organizations, and private industry occurred throughout 1971. The UNDP mineral survey in three selected areas of Sudan ended in June and reports covering the work in these areas were prepared. The Government of Sudan expected to continue the UNDP mineral studies in the Er Roseires and Hofrat en Nahas areas. A team of Soviet mineral specialists was preparing to conduct a geological survey in the Red Sea Hills area of northeastern Sudan and assist in the construction of a geological laboratory in Khartoum and Port Sudan. The Government of Sudan appeared to welcome foreign capital investment in mineral and petroleum exploration and development.

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[83] William F. Stowasser, physical scientist, Division of Nonmetallic Minerals.

[84] Henry E. Stipp, physical scientist, Division of Ferrous Metals.

A new Petroleum Resources Development Act was approved by the Economic Council and submitted to higher government authority for approval. The Government and Kuwait Chemical Fertilizer Co. signed an agreement for import into Sudan

Table 27.—Sudan: Apparent foreign trade in mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1969	1970
EXPORTS		
METALS		
Chromium, ore and concentrate	18,713	24,808
Copper metal including alloys, scrap	708	389
Iron and steel metal, scrap	2,139	5,845
Lead metal and alloys, all forms	--	250
Other, ash and residue containing nonferrous metals	4	3
MINERAL FUELS AND RELATED MATERIALS		
Petroleum refinery products:		
Gasoline thousand 42-gallon barrels	126	204
Residual fuel oil do	421	--
IMPORTS		
METALS		
Aluminum metal including alloys, all forms	374	544
Copper metal including alloys, all forms	62	421
Iron and steel:		
Pig iron, ferroalloys, and similar materials	2,896	NA
Semimanufactures:		
Bars, rods, angles, shapes, and sections	8,831	16,260
Universals, plates, and sheets	4,566	18,697
Hoop and strip	4,172	4,874
Rails and accessories	259	136
Wire	444	1,031
Tubes, pipes, and fittings	8,946	7,787
Castings and forgings, rough	141	28
Lead metal including alloys, all forms	713	488
Tin metal including alloys, all forms long tons	39	162
Zinc metal including alloys, all forms	430	146
NONMETALS		
Abrasives, natural, grinding and polishing wheels and stones	175	71
Clays and products (including all refractory brick)	NA	176
Fertilizer materials manufactured, nitrogenous	4,000	NA
Lime value, thousands	$28	NA
Sodium and potassium compounds, caustic soda	3,219	2,258
Sand, excluding metal bearing	1,275	NA
Other nonmetal:		
Crude value, thousands	$57	$72
Building materials of asphalt, asbestos and fiber, cement, and unfired nonmetals n.e.s	5,632	582
MINERAL FUELS AND RELATED MATERIALS		
Coal and coke, including briquets	NA	800
Petroleum refinery products:		
Lubricants thousand 42-gallon barrels	93	101
Mineral jelly and wax do	2	4
Other do	14	1
Mineral tar, and other coal–, petroleum–, or gas–derived crude chemicals	4,246	NA

NA Not available.

[1] Compiled from report statistics of selected trading partner countries.

Source: Supplement to the World Trade Annual. V. 3 (Africa), 1969 and 1970; prepared by the Statistical Office of the United Nations.

of $57 million worth of fertilizer. In December, Japanese specialists in fertilizers arrived in the Sudan, at the request of the government, to conduct a feasibility study of the proposed fertilizer industry.

Production of mineral commodities, shown in table 1, were valued at about $26.5 million[85] in 1971. Foreign trade in mineral commodities consisted mainly of the import of crude petroleum, iron and steel semimanufactures, and fertilizer materials. Export of mineral commodities consisted chiefly of chromite. Statistics on foreign trade are shown in table 27.

Chromite was mined in the Ingessana Hills area, east-central Sudan, about 80 miles southwest of Er Roseires, by Nile Chromium Corp. and Ingessana Hills-Mines Corp. Mining methods are simple open pit operations using laborers with picks and shovels. The deposits consist of lenticular, contiguous bodies or irregular veins of ore at shallow depths. Ore is transported by truck to the railhead at Er Roseires and by narrow gauge railway 600 miles to Port Sudan. Reserves have not been adequately measured but were estimated for one deposit at 115,510 tons of proven ore and 635,000 tons of probable and possible ore. Chromium content of the ore ranges from 49 to 52 percent. Chromium to iron ratio averages 3 to 1.

The copper deposits of Hofrat en Nahas, southwestern Dafur Province were described in a recent publication.[86] Total reserves in the old Hofrat en Nahas mine were estimated at 8.7 million tons of copper ore with an average content of 4.01 percent copper. Of this total, probable reserves were placed at 2.2 million tons of oxide ore averaging 3.61 percent copper and 2.7 million tons of sulfide ore containing 4.5 percent copper. Possible reserves were 3.9 million tons of oxide ore.

A 12,738-square-mile area of western Sudan was mapped on a scale of 1:250,000.[87] Although no significant mineral deposits are known to occur in the mapped area, galena-quartz veins, pyrite-chalcopyrite veins, and tin-tungsten veins have good potential for occurring in the area.

A publication was issued that reviewed petroleum activities in the Sudan.[88] All previous licenses have either been surrendered or lapsed, and all areas in Sudan were available for licensing. Reportedly the government was reviewing many laws with a view to improving the climate for investments in the country.

SWAZILAND[89]

The mineral industry of Swaziland contributed significantly to the value of the economy of the country in 1971. Mining and export of mainly iron ore, asbestos, and coal constituted the principal activity in the minerals sector and provided much foreign exchange. Repatriation of wages by Swaziland citizens working in mines in the Republic of South Africa also contributed a large amount of foreign exchange. The Government of Swaziland ratified its agreement to the Convention on the Settlement of Investment Disputes in June. Swaziland was the sixty-sixth country to sign and ratify the convention agreement. The European Economic Community (EEC) approved three types of association for Swaziland. They are as follows: (1) a Yaounde type agreement similar to the association of former French colonies with the EEC; (2) a more limited form of association similar to that between Uganda, Kenya, and Tanzania with the EEC; or (3) a trade agreement with the EEC. A United Nations minerals survey conducted late in 1971 indicated promising geological anomalies that could lead to development of copper, nickel, diamond, and gold deposits.[90]

A coal exploration program in Swaziland financed by the British Government Overseas Development Administration was completed at yearend. The Swaziland Government Minister of Commerce, Industry and Mines and representatives of two large mining firms discussed the possibility of establishing a project in Swaziland for the production of pig iron.

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[85] Where necessary, values have been converted from Sudanese pounds (S£) to U.S. dollars at the rate of S£1=US$2.87.

[86] Babiker, Sayed Ibrahim Mudawi. The Copper Mines of Hofrat en Nahas. Sudan News Agency Weekly Review, June 26, 1972, pp. 5–11.

[87] Vail, J. R. Geological Reconnaissance in the Zalingei and Jebel Marra Areas of Western Darfur Province Sudan. Sudan, Geol. Survey Dept. Bull. 19, February 1972, 50 pp.

[88] Sudan, Ministry of Industry and Mining. Guide to Oil Exploration in Sudan. Geological Survey Department. Bull. 20, April 1972, 19 pp.

[89] Henry E. Stipp, physical scientist, Division of Ferrous Metals.

[90] Barclays International Review (London). Swaziland. January 1972, p. 44.

Production of mineral commodities in 1971 increased in value to $29.8 million[91] compared with production valued at $27.8 million in 1970. Minerals production is shown in table 1. Foreign trade in mineral commodities consisted mainly of the export of iron ore, asbestos, coal, limestone, kaolin, barite, and pyrophyllite. Exports in 1971 were valued at about $29.5 million compared with $27.5 million in 1970. Imports of mineral commodities were mainly petroleum products, fertilizer materials, and iron and steel semimanufactures.

The feasibility of constructing a facility for processing Swaziland iron ore into pig iron was scheduled for detailed study in 1972.[92] Expenditure of over $67 million will be required, if the study indicates that the project is economically feasible. The facilities, when in operation, will employ about 2,000 persons. A study and planning period of about 9 months is scheduled to begin in January. Swaziland Iron Ore Development Co. was testing the large deposits of low-grade iron ore that occur in the northwest. If a method can be found to process the ore profitably, iron mining can continue for many years. However, if these tests are unsuccessful, future sale of iron ore will probably decrease.

Large quantities of asbestos occur in the vicinity of the present open pit mine; however, new methods of extraction must be found in order to make the operation profitable. The Havelock mine did not have a good year in 1971. Technical problems which had become apparent by the end of the previous year intensified.[93]

The results of an 18-month coal exploration program conducted at Mpaka, Lubombo District, were being studied in Britain.[94] Bulk samples of coal were sent to laboratories in Durham for detailed testing. The results of these tests, together with other information, will be used to estimate the cost of coal for a proposed thermal powerplant. If economically feasible, the plant will to be constructed near the coalfields.

Swaziland Chemical Industries and the Swaziland Government were scheduled to construct a fertilizer manufacturing plant in Swaziland. The plant will produce fertilizer from low-cost ammonia and phosphoric acid imported from Iran. An initial production capacity of 125,000 tons per annum will be established, increasing to 250,000 tons per annum. The plant will employ 150 persons and cost about $6.7 million to build. Fertilizer from the new factory will be marketed in Swaziland and the Republic of South Africa.

TOGO[95]

The mineral industry of Togo expanded in 1971 with the opening of a cement clinker crushing plant and a brick factory. The value of mineral production rose as a result of higher output from the phosphate mine, the country's dominant mineral operation. Greater exports of phosphate would have increased the favorable balance of mineral trade except for a decline in reexports of diamond.

A new 5-year development plan placed emphasis on improvements in the mining and rural sectors and sought United Nations assistance for mineral resource and geologic studies.

Further expansion of the phosphate operation was in progress, and plans for an oil refinery were being drawn up. However, the proposed cement plant at Aveta encountered financial difficulties. Mineral exploration programs were being continued throughout the country, while the offshore search for petroleum slackened but was expected to resume in the future.

Government Policies and Programs.—Emphasis has been placed on mineral research and rural development in Togo's second 5-year plan, which covers the period 1971–75. The United Nations Development Program has been requested to provide equipment and consultant services to the Togolese Mining Service in order to assist its program of mineral resource surveys.

Two other items in the plan affecting the mining industry are geologic studies of the country's ground water supply and a fertilizer promotion project which could lead to the construction of a phosphate fertilizer plant.

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[91] Where necessary, values have been converted from South African rand (R) to U.S. dollars at the rate of R1=US$1.34.

[92] Barclays International Review (London). Swaziland. December 1971, p. 41.

[93] Mining Journal (London). A Reasonable Year. V. 278, No. 7117, Jan. 14, 1972, p. 38.

[94] Commonwealth Geological Liaison Office. Newsletter. No. 1, January 1972, p. 7.

[95] David G. Willard, economist, Division of Nonmetallic Minerals.

PRODUCTION

Mineral production in Togo increased in 1971 as the result of greater phosphate output and the entry onto the scene of two new products—cement and bricks.

Compagnie Togolaise des Mines du Bénin (CTMB) mined a record 1,715,314 tons of phosphate rock during the year, an increase of 14 percent over the 1970 output. Production approached the mine's present capacity of 1.8 million tons, and a project to expand its capacity is under way.

Output of marble remained at the 1970 level of approximately 3,000 tons. Société Togolaise de Marbrerie et de Matériaux (SOTOMA), operator of the quarry, opened a brick plant at midyear and produced 500,000 bricks during the latter half of 1971. The cement clinker crushing plant of Société des Ciments de l'Afrique de l'Ouest (CIMAO) also came onstream during the year, and its output totaled 49,123 tons of cement. A construction boom in Lomé provided a strong market for all three materials.

Sand and gravel, and crushed stone were also produced for local use, but no statistics were available on their output.

TRADE

Sales of phosphate continued to account for the great majority in value of Togo's mineral exports in 1970, the latest year for which trade statistics are available. Phosphate shipments rose sharply to 1,504,000 metric tons from 1,320,000 metric tons in 1969. However, it appears likely that some late 1969 shipments were counted in the 1970 total, exaggerating the year-to-year change. Value of the phosphate exports increased by only 3 percent, from $13.0 million in 1969 to $13.4 million in 1970.

Other mineral exports, consisting largely of salt, miscellaneous metals, and reexports of diamonds and petroleum products, totaled $1.1 million in value in 1970, about one-third of the 1969 value of $3.1 million. A sharp decline in diamond reexports accounted for most of the difference. As a small, developing country Togo finds it necessary to import a wide variety of mineral commodities that are unavailable locally. The value of mineral imports rose 24 percent during the year to $8.6 million. The balance of total trade, on the other hand, showed improvement for the year mainly because of an excellent agricultural season. Total trade and mineral trade balances for 1968 through 1970 are as follows (value, in million dollars):

	1968	1969	1970
Total commodity trade:			
Exports	39.0	41.4	54.8
Imports	47.4	52.6	64.7
Balance	−8.4	−11.2	−9.9
Mineral commodity trade:			
Exports	^{r}15.7	16.1	14.5
Imports	5.4	^{r}6.9	8.6
Balance	^{r}10.3	^{r}9.2	5.9

^{r} Revised.

Togo's mineral trade balance is expected to show considerable improvement in 1971 through a 16-percent increase in phosphate sales to 1,762,000 tons, worth approximately $20 million.

Export and import statistics for individual mineral commodities are given in table 28.

COMMODITY REVIEW

Cement.—The clinker crushing plant of CIMAO went onstream in July 1971. The plant, one of a series which the company plans to construct in various West African nations, will use imported clinker until a domestic source becomes available. Booming construction demand in Lomé allowed the plant to operate at its capacity rate of 100,000 tons per year through the remainder of the year.

Approval of financing for the cement plant which will utilize the limestone deposits at Aveta has been delayed pending determination of its economic feasibility. Access to the markets of several West African nations would be required for profitability. The International Bank for Reconstruction and Development (IBRD) has been asked to provide most of the financing and was expected to complete its market studies by the end of 1971. If the project is approved, construction would begin in 1972 and the plant would go onstream during 1975–76, about 2-years later than its original target date.[96]

Marble, Brick, Tile.—The anticipated export market for Togolese marble has not

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[96] U.S. Embassy Lomé, Togo. State Department Airgram A-58, Aug. 26, 1971, 3 pp.

Table 28.—Togo: Foreign trade in selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
EXPORTS		
METALS		
Copper and alloys, unwrought	317	3
Iron and steel semimanufactures	39	144
Lead and alloys semimanufactures	19	6
NONMETALS		
Diamond ... value, thousands	$2,811	$996
Fertilizer materials crude, calcium, phosphate ... thousand tons	1,320	1,504
Precious and semiprecious stones, except diamond ... value, thousands	$67	NA
Salt	1,651	NA
Sand and gravel	42	NA
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	40	NA
Petroleum refinery products ... thousand 42-gallon barrels	8	1
IMPORTS		
METALS		
Aluminum and alloys semimanufactures	752	95
Copper and alloys semimanufactures	20	10
Iron and steel:		
Scrap	108	9
Steel, crude	6	NA
Semimanufactures	10,087	9,276
Lead:		
Ore and concentrate	10	10
Oxides	2	1
Metal and alloys semimanufactures	7	16
Silver metal ... value, thousands	$1	NA
Tin and alloys semimanufactures ... long tons	1	1
Zinc and alloys semimanufactures	86	--
NONMETALS		
Cement, hydraulic	85,833	85,640
Clays and products:		
Refractory	444	35
Nonrefractory	569	648
Diatomite and related materials	4	7
Fertilizer materials:		
Manufactured:		
Nitrogenous	132	342
Phosphatic:		
Thomas slag	18	243
Other	50	56
Potassic	18	28
Mixed	50	1,219
Ammonia	2	3
Gypsum	10	171
Lime	472	558
Pigments, mineral, natural	160	60
Salt	6,857	9,981
Sand and gravel	5,533	993
Sodium and potassium compounds n.e.s	223	542
Stone, dimension, worked	170	1,115
Sulfur, elemental	28	--
Talc and related materials	32	29
Other:		
Crude n.e.s	4	NA
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	20	NA
Carbon black	3	7
Coal	10	NA
Petroleum refinery products:		
Gasoline ... thousand 42-gallon barrels	112	140
Kerosine and jet fuel ... do	103	100
Distillate fuel oil ... do	233	258
Residual fuel oil ... do	150	112
Lubricants ... do	10	12
Liquefied petroleum gas ... do	3	4
Other ... do	24	24
Total ... do	635	650
Crude chemicals from distillation of coal, gas and petroleum	136	559

NA Not available.

developed, and production from the quarry at Gnaoulou has been limited to local needs. A construction boom in Lomé absorbed most of the output. Strong demand permitted the opening of SOTOMA's brick plant in 1971, and the company is considering construction of a ceramic tile plant.[97]

Petroleum.—Ashland Oil and Refining Company purchased Union Carbide Petroleum Corp. and thus became the operator for the group of American oil companies exploring off Togo's coast. The group's second well was unsuccessful, and no further drilling plans have been announced pending analysis of previous results. A second offshore concession was granted at the end of the year to Shell Togorex.[98] Planning was under way for an oil refinery in Togo. The refinery would have a capacity of 10,000 to 20,000 barrels per day and is expected to be financed by a loan of $30 million from British sources.[99]

Phosphate Rock.—With production already crowding the mine's current capacity of 1.8 million tons per year, CTMB is expanding its operation to reach a planned capacity of 2.4 million tons per year by 1974. Included in the $16 million project are a new mine a few miles west of the present site and additional treatment facilities.[1]

A program to promote fertilizer use among Togo's farmers is being carried out with assistance from the United Nations Industrial Development Organization. Success of the program, along with growing fertilizer markets in neighboring countries, could eventually justify the opening of a phosphate fertilizer plant.[2]

Other Minerals.—The Togolese Service des Mines and the United Nations Development Program continued exploring for minerals in various parts of Togo, but no major discoveries were announced. A uranium deposit of unknown potential was found near Farende by the German firm Uzanerzberg Baugnh.[3]

UPPER VOLTA [4]

The minerals industry of Upper Volta in 1971 contributed little to the value of the economy of the country, as represented by the gross domestic product of $333 million [5] (1970 prices). Upper Volta, a small country in the interior of West Africa, had a population of about 5.4 million. Nearly 90 percent of the population was engaged in agricultural work, mainly subsistence crop raising. Of the 3 million people in the labor force, less than 1,000 persons were employed in the minerals industry. Activity in the minerals industry consisted principally of exploration for deposits of minerals and evaluation of mineral resources discovered in previous years. The Government of Upper Volta, foreign aid agencies, and private industry organizations, carried out studies in the minerals sector in 1971. An airborne geophysical prospecting program covering a 21,230-square-mile area in the northeastern region (Liptako-Gourma) was conducted by the Canadian International Development Agency (CIDA). The survey resulted from a convention signed by Upper Volta and Canada in June.

United Nations Development Program (UNDP) continued technical, financial, and economic studies on the Tambao manganese deposit in the northeastern section of the country. A convention, signed in December, called for the UNDP to provide assistance to Upper Volta for the mineral research program covering a 3-year period. The French (Fonds d'Aide et de Coopéracion (FAC) planned to measure bauxite deposits in the vicinity of Kaya and Kongoussi, northeastern Upper Volta, beginning in 1972. Upper Volta, together with Mali and Niger, participated in the Liptako-Gourma Authority (LGA), a semi-independent political organization. The LGA is mainly concerned with the analysis, development, and exploitation of minerals that occur in a 181,420-square-mile area in the member states. The LGA region includes Ouagadougou, Niamey (Niger River), and Gao. The organization also is interested in constructing dams and powerplants along the Niger River and developing a transportation system in the area.

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[97] U.S. Embassy, Lomé, Togo. State Department Airgram A-29, May 27, 1972, p. 2.

[98] U.S. Embassy, Lomé, Togo. State Department Airgram A-39, June 27, 1972, 1 p.

[99] U.S. Embassy, Lomé, Togo. State Department Airgram A-38, June 23, 1972, p. 5.

[1] U.S. Embassy, Lomé, Togo. State Department Airgram A-40, June 26, 1972, 2 pp.

[2] U.S. Embassy, Lomé, Togo. State Department Airgram A-27, Apr. 15, 1971, attachment, p. 2.

[3] Page 3 of work cited in footnote 97.

[4] Henry E. Stipp, physical scientist, Division of Ferrous Metals.

[5] Where necessary, values have been converted from Communauté Financière Africiane Francs (CFAF) to U.S. dollars at the rate of CFAF249=US$1.00.

Production of mineral commodities in 1971 was confined to the local output of stone, clays and sand and gravel for construction purposes. Trade in mineral commodities in 1970 consisted mainly of the import of 50,800 tons of petroleum products valued at $3.8 million; 7,100 tons of iron and steel semimanufactures valued at $1.8 million; 22,400 tons of cement valued at $844,765; and 12,700 tons of salt valued at $653,430. In 1969 mineral commodity imports were mainly 43,100 tons of petroleum products valued at $3.0 million; 8,900 tons of iron and steel valued at $1.8 million; 37,500 tons of cement valued at $1.4 million; and 9,200 tons of salt valued at $472,924.[6] There was no export of mineral commodities in 1969 and 1970. Statistics on foreign trade in mineral commodities are shown in table 29.

Bauxite deposits occur on many plateaus in the central and western parts of Upper Volta. In the Kaya-Kongoussi area, 10 hills with about 1 million to 1.5 million tons each of bauxite containing from 80 to 85 percent alumina (Al_2O_3) have been reported. In the western region, surveys have discovered the occurrence of bauxite near Sabi, Diekui, and Kono.

A copper deposit containing 40 million tons of 0.8 percent copper with small quantities of gold reportedly occurs near Gaoua, southwestern region. Another small deposit containing ore with 2 percent copper content also occurs in the vicinity of Gaoua. The consortium headed by the French Bureau de Recherches Géologiques et Minières (BRGM) decided that the deposits were too small to mine economically and ended its concession agreement.[7] Another deposit estimated to contain 50 million tons of copper and molybdenum ore with a copper content of 0.5 percent reportedly has been located recently in the Kaya-Kongoussi area.

An iron ore (magnetite) deposit near Oursi, 50 miles west of Tambao, has not been measured; however, it covers an area of 28.8 square miles. Surface ore samples gave an iron content of 40 to 55 percent, vanadium pentoxide 0.9 to 1.0 percent, and titanium dioxide 8 to 14 percent.

Probably the most important deposit in Upper Volta is the manganese occurrence near Tambao, 211 miles northeast of Ouagadougou. This deposit, which contains about 13 million tons of manganese oxides assaying from 54 to 55 percent manganese, was discovered in 1960 by the BRGM and studied intensively by various United Nations teams. Its remote location and lack of transportation, water, and power facilities have prevented development of the deposit by large international organizations.

The limestone deposit of Tin Hrassan, 18 miles northeast of Tambao, contains reserves estimated at 56 million tons with a calcium oxide content of from 47 to 50 percent and a magnesium oxide content of about 2.75 percent. Phosphorus content is negligible. The limestone could be used for cement manufacture; however, the lack of transportation and power facilities, together with the small quantity of cement consumed in Upper Volta, make this development uneconomic.

In addition to the deposits described, there are smaller deposits of dolomite, kaolin, granite, and marble that are used mostly for building materials.

Table 29.—Upper Volta: Apparent imports of mineral commodities [1]
(Metric tons unless otherwise specified)

Commodity	1969	1970
Aluminum and alloys, all forms	NA	41
Cement, hydraulic	6,136	--
Clay products, nonrefractory	192	318
Copper metal and alloys, unwrought and semimanufactures	16	--
Iron and steel semimanufactures	5,698	9,239
Petroleum refinery products:		
Lubricants — 42-gallon barrels	3,710	4,312
Other — do	196	NA

NA Not available.
[1] Compiled from report statistics of selected trading partner countries.

Source: Statistical Office of the United Nations, 1969 and 1970 editions of Supplement to the World Trade Annual. V. 3 (Africa), published by Walker and Co., New York, 1971 and 1972.

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[6] U.S. Embassy, Ouagadougou. State Department Airgram A-56, June 18, 1971, p. 10.

[7] Le Moniteur Africain (Dakar). Difficulties Foreseen for Mineral Exploitation. Dec. 2, 1971, p. 11.

The Mineral Industry of Other Near East Areas

By David A. Carleton,[1] and Bernadette Michalski[2]

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Oman	1067
People's Democratic Republic of Yemen	1068
Qatar	1069
Syrian Arab Republic	1071
United Arab Emirates	1071
Yemen	1074

BAHRAIN[3]

On August 14, 1971, the island emirate of Bahrain declared its independence. The following day British and Bahraini officials formally agreed to end the century-old treaty between the two. Under the old treaty the United Kingdom conducted Bahrain's foreign affairs and defense. The United Kingdom in 1968 had announced its intention to withdraw its forces from the Persian Gulf by December 1, 1971.

During the period following independence, the performance of Bahrain's economy surpassed most expectations. The industrial boom reflected Bahrain's development as a regional service center and the Government's policy of industrialization. Despite what appears to be an enormous trade gap, Bahrain, with currency more than covered by gold and foreign exchange, has no balance of payments problems. Construction has been the sinew of the unprecedented expansion. One in every six persons in the labor force was involved with construction.

Table 1.—Other Near East Areas: Production of mineral commodities

Area, commodity, and unit of measure	1969	1970	1971 p
BAHRAIN [1]			
Gas, natural:			
Gross production million cubic feet	33,440	25,406	25,364
Market production do	10,906	12,305	17,902
Petroleum:			
Crude thousand 42-gallon barrels	27,774	27,973	27,346
Refinery products:			
Gasoline and naphtha do	15,648	15,687	8,268
Jet fuel do	13,752	13,892	15,634
Kerosine do	1,102	1,076	1,139
Distillate fuel oil do	17,101	16,993	19,301
Residual fuel oil do	35,651	39,347	38,739
Other do	59	1,287	5,745
Refinery fuel and losses do	4,063	4,443	4,134
Total do	87,376	92,725	92,960

See footnotes at end of table.

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[1] Petroleum specialist, Division of Fossil Fuels.

[2] Foreign mineral specialist, Division of Fossil Fuels.

[3] Prepared by David A. Carleton.

Table 1.—Other Near East Areas: Production of mineral commodities—Continued

Area, commodity, and unit of measure		1969	1970	1971[p]
JORDAN [1]				
Cement	thousand metric tons	[r] 490	378	400
Gypsum	do	[e] 35	26	24
Fertilizer materials, crude, phosphate rock	do	[r] 1,097	891	[r] 528
Lime	do	[e] 40	45	2
Petroleum refinery products:				
Gasoline	thousand 42-gallon barrels	738	825	1,226
Kerosine	do	534	590	724
Distillate fuel oil	do	921	762	844
Residual fuel oil	do	759	853	781
Liquefied petroleum gas	do	333	161	186
Asphalt	do	230	168	210
Refinery fuel and losses	do	197	161	381
Total	do	3,712	3,520	4,352
Salt	metric tons	19,416	25,000	24,000
Stone:				
Limestone	thousand metric tons	NA	1,000	1,865
Marble	thousand square meters	NA	75,000	50,000
LEBANON [1]				
Cement	thousand metric tons	1,253	1,339	1,499
Gypsum	do	35	35	37
Lime	do	120	130	125
Petroleum refinery products:				
Gasoline	thousand 42-gallon barrels	2,957	3,490	3,461
Jet fuel	do	1,379	1,599	1,679
Kerosine	do	270	265	194
Distillate fuel oil	do	2,375	2,673	2,510
Residual fuel oil	do	5,888	6,636	6,378
Other	do	445	469	470
Refinery fuel and losses	do	608	694	638
Total	do	13,922	15,826	15,330
Salt	metric tons	28,000	37,000	38,000
OMAN [1]				
Gas, natural:				
Gross production[e]	million cubic feet	20,000	20,000	21,500
Marketed production	do	(2)	(2)	(2)
Petroleum, crude	thousand 42-gallon barrels	119,710	121,210	107,430
PEOPLE'S DEMOCRATIC REPUBLIC OF YEMEN [1]				
Petroleum refinery products:				
Gasoline	thousand 42-gallon barrels	2,410	1,591	1,849
Jet fuel	do	4,878	7,384	4,047
Kerosine	do	2,134		1,217
Distillate fuel oil	do	5,006	8,100	4,333
Residual fuel oil	do	29,399	23,551	13,432
Other	do	311	5,100	1,576
Refinery fuel and losses	do	2,865	2,219	546
Total	do	47,003	47,945	27,000
Salt	metric tons	63,000	[e] 45,000	[e] 35,000
QATAR [1]				
Cement	thousand metric tons	50	100	72
Gas, natural:				
Gross production	million cubic feet	125,687	127,000	159,418
Marketed production	do	37,290	[e] 39,000	46,480
Petroleum:				
Crude	thousand 42-gallon barrels	129,746	132,456	156,882
Refinery products:				
Gasoline	do	63	68	64
Kerosine	do	33	34	30
Distillate fuel oil	do	50	56	58
Residual fuel oil	do	80	77	78
Refinery fuel and losses	do	21	19	17
Total	do	247	254	247
SYRIAN ARAB REPUBLIC [1, 3]				
Asphalt, natural	thousand metric tons	65	65	NA
Cement	do	934	968	880
Gypsum [e]	do	15	15	15
Petroleum:				
Crude	thousand 42-gallon barrels	16,771	29,356	36,462
Refinery products:				
Gasoline	do	1,696	3,264	2,360
Kerosine and jet fuel	do	1,588	1,821	2,202
Distillate fuel oil	do	2,179	2,723	4,540

See footnotes at end of table.

Table 1.—Other Near East Areas: Production of mineral commodities—Continued

Area, commodity, and unit of measure	1969	1970	1971 p
SYRIAN ARAB REPUBLIC [1] [3]—Continued			
Petroleum—Continued			
Refinery products—Continued			
Residual fuel oil .... thousand 42-gallon barrels	3,629	4,063	4,783
Other .... do	414	1,087	2,548
Refinery fuel and losses .... do	355	1,376	1,090
Total .... do	9,861	14,334	17,523
Salt e .... thousand metric tons	22	22	22
Sand, glass e .... do	13	15	NA
UNITED ARAB EMIRATES (FORMERLY TRUCIAL STATES) [1] [4]			
Abu Dhabi:			
Gas, natural:			
Gross production .... million cubic feet	r 233,841	266,200	365,543
Marketed production .... do	23,740	26,700	39,749
Petroleum, crude .... thousand 42-gallon barrels	218,798	252,179	341,004
Dubai:			
Gas, natural:			
Gross production e .... million cubic feet	3,000	25,000	36,000
Marketed production e .... do	700	6,000	10,000
Petroleum, crude .... thousand 42-gallon barrels	3,800	31,321	45,651
YEMEN			
Salt e .... thousand metric tons	r 109	79	87

e Estimate. p Preliminary. r Revised. NA Not available.

[1] In addition to the commodities listed, crude construction materials such as clays, stone, and sand and gravel presumably also are produced, but output is not recorded and general information is inadequate to make reliable estimates of production levels.

[2] No marketed production is reported; however, there may be some small field use.

[3] In addition to the commodities listed, natural gas presumably also is produced but output is not recorded and general information is inadequate to make reliable estimates of production levels.

[4] In addition to the two emirates listed in this table, there are five others; Ajman, Fujairah, Ras al-Khaimah, Sharjah, and Umm al-Qaiwain; which record no production but which presumably produce small quantities of crude construction materials.

Major mineral industry activity involved the island's petroleum industry and an aluminum smelter. The Government derived its revenue principally from the production of some 27 million barrels per year of crude oil by Bahrain Petroleum Co., Ltd. (Bapco), which is held on a 50-50 basis by Texaco, Inc., and Standard Oil Co. of California. Since 1966, Bahrain has received a half-share of the income from Saudi Arabia's offshore Abu Safah oilfield. Revenue received from crude oil produced in 1971 was an estimated $70 million.

Petroleum industry developments were highlighted by the September 1971 announcement that Bapco planned to install a desulfurization unit at its Awali refinery. The 50,000-barrel-per-day unit will be built by Nippon Oil Co. which has been associated with the California Texas Oil Co. (Caltex) since 1949. Using the indirect method, the sulfur content of residual fuel oil will be reduced from a range of 2.5 to 3.0 percent to a range of 0.5 to 1.0 percent. Nippon Oil Co., which markets with Caltex in Japan, will market the low-sulfur residual fuel oil in Japan.

Although no exploration wells were drilled in the Bapco concession area in 1971, data from the 1970 underwater gravimetric geophysical survey continued to be processed in relation to information accruing from onshore surveys.

Five development wells were drilled into the Bahrain producing formation and the two gas wells drilled into the Arab formation were completed to provide a reserve gas supply for the refinery and Government powerplant.

During the year crude oil production by Bapco averaged 74,922 barrels daily down slightly from 1970, but essentially unchanged since 1968. Well status as of December 31, 1971 was as follows:

Producing oil	215
Producing gas	8
Injecting gas	7
Shut-in	10
Abandoned	23
Total	263

Deliveries of natural gas from the Khuff formation to the Aluminum Bahrain, Ltd. (Alba) aluminum reduction plant, which began in March, had increased to 41 million cubic feet daily by the end of the year. Natural gas produced from the Arab formation amounted during 1971 to 18.3 billion cubic feet of which 5.7 billion cubic feet were delivered to the Government powerplant at Jufair and 6.3 million cubic feet were consumed at the Awali refinery. The remaining 6.3 million cubic feet were injected into the Bahrain formation for pressure maintenance.

For the second year in succession the Awali Refinery operated at record levels. Total runs to the plant averaged 257,779 barrels per day whereas crude processed in July averaged 288,817 barrels per day, surpassing a previous months' average high. To enable the increased output to be shipped efficiently, two 350,000-barrel storage tanks and a 30-inch pipeline to Sitra port were completed.[4]

Superior Oil Co., a United States firm, completed a seismic survey of its offshore concession area and following a thorough evaluation decided to drill in early 1972. The company's outlook was far from optimistic; their concession area had been relinquished by two previous companies.

Final decision on the building of a supertanker drydock in Bahrain will not be made until mid-1972. Studies made during 1970 and 1971 have established the commercial viability of the project. The scheme has the overall approval of the Organization of Arab Petroleum Exporting Countries (OAPEC) whose members will have ownership majority.

The $250 million aluminum plant built by Alba at Askar began production in May following the first delivery of alumina from Australia. The smelters were built by British Smelter Construction, Ltd., at a cost of about $150 million; the remainder was spent on ancilliary equipment including port facilities. At the end of 1971 half of the full complement of 400 pots were in production. The remaining two potlines will be completed by the end of 1972, bringing the plant on full stream with a capacity of 120,000 tons per year. Aluminum produced in the early stages was estimated as costing $0.21 per pound, and then $0.145 per pound over the decade, compared with $0.24 per pound, a representative current price. The low cost is attributed to the nominal cost of fuel.[5]

Early in 1971 the Bahrain Government signed a 12-year loan agreement for $2.8 million to finance part of the Government's share of the Alba project. Other credits were signed between Williams and Glyn's Bank of the United Kingdom and the Ruler of Bahrain.[6]

It was announced during November 1971 that the Government had approved a plan to build an aluminum extrusion plant at a cost of about $2.5 million to be financed partly by the Government and partly by Kaiser Aluminum and Chemical Corp. Construction of the plant, which will complement the Alba smelter, was scheduled to begin early in 1972 and to take about 18 months to complete. Production capacity will be about 3,000 tons per year.

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[4] The Bahrain Petroleum Co., Ltd. 1971 Annual Report.

[5] Mining Magazine. V. 125, No. 1, July 1971, p. 53.

[6] Mining Journal. V. 276, No. 7071, Feb. 26, 1971, p. 138.

Table 2.—Bahrain: Trade of crude petroleum and petroleum refinery products

(Thousand 42-gallon barrels)

Commodity	1969	1970	1971
EXPORTS			
Petroleum refinery products:			
Gasoline	7,784	16,261	5,490
Naphtha	7,611		8,441
Jet fuel	13,681	13,710	15,870
Kerosine	1,032	992	1,079
Distillate fuel oil	15,915	20,823	21,697
Residual fuel oil	29,750	28,818	28,694
Lubricants	3	8	1,117
Other	r 998	567	165
Total	76,774	r 81,179	82,553
BUNKER LOADINGS			
Petroleum refinery products:			
Distillate fuel oil	772	623	727
Residual fuel oil	5,747	6,261	6,352
Total	6,519	6,884	7,079
IMPORTS			
Crude petroleum	58,230	63,518	65,989
Petroleum refinery products:			
Gasoline and naphtha	1,588	1,712	1,317
Kerosine	174	39	--
Lubricants	11	18	20
Total	1,773	1,769	1,337

r Revised.

JORDAN [7]

The Jordanian mineral industry was hampered by the unsettled political atmosphere in 1971. Petroleum refiners, cement producers, and phosphate rock miners did not realize profits of previous years.

The most significant development in the Jordanian mineral industry during 1971 was the expansion of the Zerka refinery from a 7,500-barrel-per-day to a 15,000-barrel-per-day capacity. The expansion cost was $9.5 million under contract to Chyioda Chemical and Engineering Co. In addition to supplying crude to the nation's only refinery Trans-Arabian Pipeline (TAPline) is also a source of revenue for Jordan affording approximately $11.26 million in transit and related fees in 1971. Petroleum and petroleum product imports totaled $14 million in 1971.

Phosphate rock deposit exploration and mine development continued during the year. Production capacity was estimated at 2 million tons per year. By 1975 production capacity is scheduled to reach 3 million tons per year. While plans were announced for the construction of a phosphate fertilizer plant of 200,000-ton capacity by 1975, most of Jordanian phosphates will continue to be exported. During 1971 phosphate exports earned an estimated $6 million, providing about 19 percent of Jordan's foreign exchange earnings of $32 million in 1971.

Phosphate rock exports declined by an estimated 25 percent as compared with those of 1970. The Syrian Government's refusal to permit Jordanian goods to transit through its territory to the ports of Lebanon during the last 6 months of 1971 was a contributing factor.

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[7] Prepared by Bernadette Michalski.

Table 3.—Jordan: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum unwrought	289	186	Syrian Arab Republic 131; Lebanon 52.
Copper matte	872	606	All to Lebanon.
Iron and steel:			
Metal scrap	2,913	7,109	Do.
Semimanufactures	296	253	Lebanon 132.
Lead, unwrought	16	317	Lebanon 267; United Kingdom 50.
NONMETALS			
Cement	30,061	55,746	Saudi Arabia 47,255.
Fertilizer materials, phosphatic	928,297	656,227	NA.
Stone, sand and gravel:			
Dimension stone, crude and partly worked:			
Calcareous	1,047	859	Iraq 713; Kuwait 62.
Granite	13,715	7,579	Syrian Arab Republic 5,120; Lebanon 1,195.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	4,923	997	Saudi Arabia 947; Syrian Arab Republic 20.
Gas, hydrocarbon, natural	790	72	Saudi Arabia 61; Syrian Arab Republic 11.

NA Not available.

Table 4.—Jordan: Imports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum and alloys, semimanufactures	514	723	Lebanon 406.
Copper and alloys, all forms	150	272	Lebanon 98; United Kingdom 61.
Iron and steel:			
Pig iron, ferroalloys, and similar materials	4,131	320	All from Belgium.
Steel, primary forms	34,152	23,676	All from United States.
Semimanufactures	49,950	46,496	India 8,206; Lebanon 2,257.
Lead:			
Oxides	696	863	United Kingdom 792.
Metal, including alloys	888	1,279	Kuwait 1,027.
Other:			
Base metals, including alloys, unwrought, n.e.s	42	--	

See footnotes at end of table.

Table 4.—Jordan: Imports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
NONMETALS			
Cement	11,698	5,701	Lebanon 4,275; Denmark 580.
Clays, crude	783	--	
Fertilizer materials, crude or manufactured:			
Nitrogenous	3,874	1,888	Arab Republic of Egypt 955; Bulgaria 307.
Phosphatic	7,461	6,454	Lebanon 3,800; Italy 1,131.
Potassic	857	4,357	Netherlands 1,496; Italy 1,098.
Lime	2,605	2,382	Lebanon 2,380.
Sodium and potassium compounds, caustic soda	684	621	Italy 291; Netherlands 153; United Kingdom 144.
Stone, sand and gravel, dimension stone, calcareous (marble)	935	668	Italy 343; Lebanon 289.
Sulfur	1,847	685	Lebanon 526; France 124.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	1,276	--	
Coke and semicoke	464	--	
Petroleum, crude thousand 42-gallon barrels	3,712	3,521	All from Saudi Arabia.
Refinery products:			
Gasoline do	33	66	Greece 51; Netherlands 10.
Kerosine do	200	258	Greece 148; Italy 62.
Lubricants do	55	38	Lebanon 18; Iraq 7.
Other, bituminous mixtures do	1	--	
Total do	289	362	

[1] Jordanian imports transshipped through Lebanon or at least in part reported under the heading "Lebanon-Foreign" in official statistics without recording actual country of origin. These materials are credited to Lebanon in this table together with those materials actually from Lebanon.

LEBANON [8]

Lebanese mineral commodity output during 1971 was limited to several nonmetallic minerals, metal semimanufactures based on imported crude metal forms and petroleum products derived from imported crude petroleum at Lebanon's two refineries. Refinery throughput of crude was reported at 44,000 barrels per day.

A supplemental agreement was signed and ratified between the Lebanese Government and the Iraq Petroleum Company (IPC), which provides a revised formula for calculating IPC guaranteed annual profit and the invoice price of crude oil delivered to the 30,000-barrel-per-day Tripoli refinery. The agreement will presumably open avenues for construction of a 6,200-barrel-per-day catalytic cracking unit at the Tripoli refinery, a project long delayed by lack of government authorization. The installation of a catalytic cracker at Tripoli will raise the yield of gasoline and diminish the yield of fuel oil, both critical factors in the Lebanese petroleum product consumption pattern.

The construction of a third refinery with Saudi Arabian participation through General Petroleum and Mineral Organization (Petromin) was still under consideration. A feasibility study was completed by Universal Oil Products but results were not released. By yearend the Institut Français du Pétrole was under consideration for a possible second feasibility study on the proposed third refinery in Lebanon.

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[8] Prepared by Bernadette Michalski.

Table 5.—Lebanon: Exports and reexports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum metal including alloys, all forms	r 5,329	5,769	Syria 1,748; Iraq 1,019; Kuwait 368.
Copper metal including alloys, all forms	482	419	Belgium 163; Spain 50; West Germany 48.
Gold unworked or partly worked troy ounces	r 92,948	244,924	Saudi Arabia 111,081; Kuwait 50,477.
Iron and steel:			
Scrap	24,474	62,805	Yugoslavia 30,292; Italy 16,883; Arab Republic of Egypt 10,304.
Pig iron	--	30	Saudi Arabia 19; Syria 10.

See footnotes at end of table.

Table 5.—Lebanon: Exports and reexports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS—Continued			
Iron and steel—Continued			
Steel, primary forms and semimanufactures	[r]26,100	46,011	Turkey 9,796; Iraq 8,382; Syria 2,711.
Lead metal including alloys, all forms	305	307	Kuwait 75; Saudi Arabia 38; Jordan 26.
Magnesium semimanufactures	2	--	
Molybdenum	2	1	All to United States.
Nickel metal including alloys, all forms	9	6	Kuwait 3; Belgium 2; Libya 1.
Platinum group including alloys, all forms troy ounces	1,863	3,858	United Kingdom 2,251; Kuwait 1,607.
Silver including alloys, all forms do	176,829	317,874	Switzerland 245,471; United Kingdom 70,089.
Zinc metal including alloys, all forms	3	24	Iraq 15; Saudi Arabia 6; Kuwait 2.
Other, precious, waste and scrap	61	19,294	Belgium 14,502; Switzerland 4,300.
Other ores and concentrate of base metals, n.e.s	60	--	
NONMETALS			
Abrasives, natural, pumice, emery, natural corundum etc	307	34	Saudi Arabia 9; Libya 9; Kuwait 8.
Cement	354,569	470,642	Algeria 188,010; Yugoslavia 103,893; Nigeria 84,150.
Chalk	4	9	Kuwait 7; Jordan 1; Saudi Arabia 1.
Clays and products:			
Crude	69	172	Jordan 115; Syria 31; Saudi Arabia 13.
Products:			
Refractory	338	269	Jordan 124; Iraq 57; Saudi Arabia 40.
Nonrefractory	1,137	1,172	Saudi Arabia 495; Kuwait 236; Jordan 213.
Diamond, all grades carats	18,175	54,500	Switzerland 21,000; France 13,500; Greece 5,000.
Diatomite	14	37	Saudi Arabia 31; Turkey 5.
Fertilizer materials:			
Crude	170	510	Jordan 505; Saudi Arabia 5.
Manufactured:			
Nitrogenous	99	9,216	Syria 9,184; Saudi Arabia 32.
Phosphatic	57,021	52,013	Pakistan 12,000; Italy 9,880; Syria 8,896.
Potassic	1	--	
Other	3,101	637	Syria 612; Saudi Arabia 25.
Ammonia	28	106	Syria 104; Kuwait 1; Jordan 1.
Gem stones, precious and semiprecious except diamond carats	771,470	2,285,000	United Kingdom 655,000; Switzerland 640,000; West Germany 205,000.
Graphite	7	1	All to Saudi Arabia.
Gypsum and anhydrite	2,148	676	Ghana 325; Libya 175; Jordan 140.
Lime	55,140	61,711	Libya 48,888; Saudi Arabia 8,670; Jordan 2,768.
Pigments, mineral	10	14	Saudi Arabia 13; Jordan 1.
Pyrite	800	--	
Salt	16	59	Saudi Arabia 50; Kuwait 2.
Sodium and potassium compounds, caustic soda and caustic potash	45	54	Jordan 18; Liberia 18; Syria 12.
Stone, sand and gravel:			
Dimension stone, crude and partly worked:			
Calcareous	1,932	1,638	Kuwait 806; Jordan 387; Saudi Arabia 296.
Noncalcareous	400	467	Kuwait 384; Saudi Arabia 76.
Dimension stone, worked	3,185	3,213	Kuwait 2,103; Saudi Arabia 869; Qatar 128.
Gravel and crushed rock	1,768	1,763	Jordan 1,467.
Sand	1,300	557	Syria 534; Kuwait 9.
Sulfur:			
Elemental, all forms	3,987	2,667	Jordan 993; Iraq 657; Cyprus 500.
Sulfuric acid	1,217	1,504	Syria 844; Libya 478; Cyprus 71.
Talc and steatite	51	5	All to Libya.
Nonmetals, n.e.s	157	76	Italy 57; Saudi Arabia 10; Belgium 9.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	2	10	West Germany 5; Syria 4; Saudi Arabia 1.
Coal, all grades	420	235	Jordan 180; Saudi Arabia 49; Qatar 5.
Coke and semicoke	1,594	1,052	Syria 403; Iraq 344; Jordan 248.
Gas, natural	2,846	1,533	Syria 1,181; Cyprus 351.
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	371	252	Jordan 53; Syria 36.
Kerosine do	2,023	2,398	Jordan 173; Syria 167.
Gas oil do	3,697	4,633	Italy 932; Arab Republic of Egypt 406; Greece 404.
Lubricants do	236	328	Jordan 146.
Other petroleum products do	14	--	
Total do	6,341	7,611	

[r] Revised.

Source: Direction Générale des Douanes. Statistiques du Commerce Extérieur. V. 1, 1969 and 1970.

Table 6.—Lebanon: Imports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum:			
Oxide and hydroxide	1,751	1,503	France 1,400; West Germany 101.
Metals including alloys, all forms	8,052	8,631	Greece 3,886; Canada 1,414; France 1,224.
Copper metal including alloys, all forms	872	1,190	Belgium 280; France 174; United States 145.
Gold unworked or partly worked thousand troy ounces	2,106	3,382	Switzerland 1,948; United Kingdom 961; France 469.
Iron and steel:			
Scrap	3,411	34,337	Kuwait 18,226; Jordan 4,635; Iraq 4,221.
Pig iron and ferroalloys	10,716	1,433	Poland 994; France 257.
Steel:			
Common grades:			
Primary forms	101,846	110,223	U.S.S.R. 51,708; Bulgaria 25,724; Romania 22,073.
Semimanufactures	167,754	119,767	Czechoslovakia 29,932; West Germany 16,912.
Alloys and high carbon, primary forms and semimanufactures	822	1,121	Japan 398; Austria 330; West Germany 130.
Lead:			
Oxide	107	107	West Germany 47; France 29; United Kingdom 27.
Metal including alloys, all forms	1,222	1,184	Kuwait 419; Jordan 327; West Germany 150.
Magnesium metal including alloys, all forms	2	1	All from France.
Mercury 76-pound flasks	671	14	West Germany 8; Spain 2; Japan 2.
Nickel metal including alloys, all forms	8	9	West Germany 5; France 2; United Kingdom 2.
Platinum group including alloys, all forms troy ounces	5,305	7,298	United Kingdom 2,476; Syrian Arab Republic 2,411; Japan 803.
Silver including alloys, all forms do	24,049	48,194	France 13,760; United Kingdom 10,417.
Tin, including alloys, all forms long tons	27	86	United Kingdom 60; Malaysia 20.
Titanium, oxide	1,167	8,912	West Germany 3,400; United Kingdom 3,300; Finland 1,276.
Zinc:			
Oxide	105	43	East Germany 16; France 10; U.S.S.R. 10.
Metal including alloys all forms	881	958	Belgium 420; Iraq 334.
NONMETALS			
Abrasives, natural, pumice, emery, natural corundum etc	2,675	3,038	Greece 1,300; West Germany 503; People's Republic of China 268.
Asbestos	6,023	6,418	Republic of South Africa 2,252; Cyprus 2,118; Canada 1,996.
Barite	20	20	All from Italy.
Cement	1,285	1,085	Denmark 496; Belgium 347; France 242.
Chalk	1,933	932	United Kingdom 336; Belgium 225; Romania 100.
Clays and products:			
Crude	5,436	7,880	United Kingdom 5,116; Greece 1,368.
Products:			
Refractory	3,229	2,544	West Germany 938; People's Republic of China 396; Morocco 284.
Nonrefractory	7,034	7,595	Italy 3,027; West Germany 1,425; France 997.
Diamond, all grades carats	58,205	56,465	Belgium 27,330; India 10,560; Zaire 5,470.
Diatomite	286	218	United States 216.
Feldspar and fluorspar	510	1,130	Italy 780; Austria 200; Yugoslavia 150.
Fertilizer materials:			
Natural:			
Phosphate rock	91,200	143,037	Jordan 143,034; Syrian Arab Republic 2.
Other	6,825	2,924	Chile 2,651; France 113; Spain 80.
Manufactured:			
Nitrogenous	17,466	28,452	United Kingdom 10,753; West Germany 9,249; Italy 5,220.
Phosphatic	100	102	All from Belgium.
Potassic	5,510	8,237	Spain 4,100; West Germany 1,490; East Germany 1,000.
Other	1,101	1,676	West Germany 1,220; Portugal 332.
Ammonia	8,937	16,948	France 8,514; Italy 6,420; United States 1,018.
Gem stones, precious and semiprecious except diamond:			
Natural thousand carats	4,767	7,015	West Germany 2,565; People's Republic of China 1,340; India 1,105.
Manufactured do	3,112	4,755	France 3,625; Switzerland 650.
Powder, waste, etc	150	130	All from West Germany.

Table 6.—Lebanon: Imports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
NONMETALS—Continued			
Graphite	28	69	People's Republic of China 40; Tanzania 20; Italy 5.
Gypsum and anhydrite	45,716	48,231	Syrian Arab Republic 43,673.
Lime	22	28	United Kingdom 15; Netherlands 7; West Germany 6.
Magnesite	1	12	Netherlands 11; Italy 1.
Mica, all forms	15	28	United Kingdom 12; Norway 9; Romania 5.
Pigments, mineral including processed iron oxides	246	133	West Germany 70; United Kingdom 24; Spain 12.
Pyrite	18	1	All from Morocco.
Salt	411	1	All from United Kingdom.
Sodium and potassium compounds	3,235	5,017	Italy 2,565; Romania 1,580.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous	19,700	23,506	Italy 16,285; Turkey 3,000.
Noncalcareous	2,350	2,670	Syrian Arab Republic 2,211; Italy 394.
Worked	129	177	Italy 105; Syrian Arab Republic 23; Belgium 11.
Dolomite	6	--	
Gravel and crushed stone	11,969	8,510	Italy 5,850; Jordan 2,223; France 341.
Limestone	11	--	
Quartz and quartzite	23	45	Norway 39; Republic of South Africa 6.
Sand	557	1,191	Syrian Arab Republic 1,133; France 21; United States 21.
Sulfur:			
Elemental, all forms	57,196	61,888	France 61,002; West Germany 215.
Sulfuric acid	15,182	140	Netherlands 86; U.S.S.R. 50.
Talc and steatite	593	387	People's Republic of China 234; Italy 80; Norway 36.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	81	15	West Germany 10; United States 5.
Carbon and carbon black	65	65	United States 44; United Kingdom 13.
Coal, all grades	1,150	300	All from Belgium.
Coke and semicoke	11,546	5,101	France 3,922; Poland 1,179.
Peat	108	29	All from Romania.
Petroleum refinery products:			
Gasoline..thousand 42-gallon barrels	2,990	3,170	Iraq 2,668; Saudi Arabia 478.
Kerosine........do	347	402	Iraq 336; Saudi Arabia 63.
Gas oil and fuel oil........do	4,697	5,199	Iraq 4,136; Saudi Arabia 1,056.
Lubricants........do	122	125	Italy 65; United Kingdom 33.
Liquefied petroleum gas........do	713	712	Italy 303; Iraq 180; France 155.
Mineral jelly and wax........do	5	6	Romania 2; U.S.S.R. 1.
Other........do	198	163	Iraq 136.
Total........do	9,072	9,777	
Mineral tar and other coal-, petroleum- or gas-derived crude chemicals	616	402	Netherlands 372.

Source: Direction Générale des Douanes. Statistiques de Commerce Extérieur. V. 1, 1969 and 1970.

OMAN[9]

Oman's petroleum industry completely dominates the country's mineral industry. In addition to unused associated gas produced with the crude oil and possibly some nonmetallic construction materials, no other mineral commodities are produced. As one of the least developed countries in the Middle East, the nation has had limited opportunity for economic advancement as former rulers have restricted economic development. In 1971, under the leadership of the present ruler, Sultan Qaboos, Oman was admitted as a full member into the Arab League, the United Nations, the World Bank, and the International Monetary Fund. The discovery and development of crude oil in Oman has been the catalyst to the nation's efforts to join the world community. The year 1971 was one of considerable achievement.

Progress on the new international airport was rapid and many new schools were built or under construction. A contract equivalent to $23.4 million for a road along the Batinah coast was awarded to a British firm and a contract for $44.3 was let to a West German consortium for the construction of a new port.

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[9] Prepared by David A. Carleton.

Petroleum Development (Oman), Ltd. (PDO), concessionaire for most of onshore Oman, brought its fourth field, al-Huwaisah, into production in February 1971. However, because of the increased water encroachment in Natih and Fahud oilfields, production was cut back during the year. Crude oil production in 1971 averaged 294,328 barrels per day, 11 percent less than in 1970. The following tabulation gives production by field in thousands of barrels per year:

	1970	1971
Yibal	8,946.9	11,778.1
Natih	36,488.3	29,543.9
Fahud	75,775.3	55,644.1
al-Huwaisah	--	10,463.7
Total	121,210.5	107,429.8

Production was particularly hampered during the year by a blowout at Yibal-14 which was not finally overcome until June 1971. At that time six drilling rigs were operating within the concession area. During the year, a total of 246,531 feet was drilled. Of this, 64,607 feet was exploration drilling in 11 wells, none of which proved successful. Development drilling in the existing four fields accounted for the remaining 181,924 feet drilled. Six seismic survey parties completed 82 party-months of geophysical surveying during the year.

In the Fahud field, nine water injection wells and six producing wells were drilled. Two water injection wells were drilled in the Natih field and six in the Yibal field as part of the secondary recovery water injection project. Eleven development wells were also drilled at Yibal. In addition, five development wells and one appraisal well were drilled in the al-Huwaisah field.

The terms of the February 15, 1971, Tehran Agreement between Persian Gulf members of the Organization of Petroleum Exporting Countries (OPEC) and the oil-producing companies operating in those States were incorporated in the PDO concession. As a result, the posted price for Omani crude was raised from $1.82 per barrel for 33° API gravity crude to $2.05 per barrel on February 15, 1971, and again to $2.31 per barrel on June 1, 1971.

Although production declined, government revenue from oil, rose 7.5 percent because of the application of the OPEC accords at Tehran. PDO payments to the Oman Government in 1971 totaled $124 million, including royalties, taxes, and the third annual rental payments of $260,000 for the Dhofar area concession. This latter concession is only for 6 years ending June 1975 unless oil is discovered. This explains increased exploration drilling of 20 wells during 1970 and 1971 compared with four wells during the previous 2 years. Government revenue rose from $0.88 per barrel in 1970 to $1.08 in 1971.

Wintershall, A.G., the West German operator of the concession offshore from the Batinah coast which completed an unsuccessful well in 1970, planned to complete a second well at the end of 1971 at a site 4 miles north of Daymaniayt Islands.

Early in September the Sultan formally withdrew the oil offshore concession he had granted in 1970 to Wendell Phillips, an American citizen. The concession covered Oman's continental shelf between Ras al Hadd and the Dhofar border. The Government announced that it would soon put the acreage up to tender by other interested oil companies.

PEOPLE'S DEMOCRATIC REPUBLIC OF YEMEN[10]

The South Yemen-Algerian Petroleum Co. (Syapco), the joint venture between Algeria's national oil company SONATRACH, (49 percent) and the Petroleum Board of South Yemen (51 percent), completed its initial season of seismic surveying on the 76,000-square-mile concession in the Hadhramaut in July 1971. This area was under concession until 1966 to a subsidiary of Standard Oil Co. (Indiana). Beginning in November 1970, a Syapco crew completed 740 kilometers of profile in the vicinity of Thamud, extending southwest to Hawarin where a dry hole was drilled by the former concessionaire and north to the southern edge of the Rub 'al Khali. Profiles were done east of Thamud to an Indiana dry hole site near Tarfit. The results of the geophysical survey, which were described as being good technically, were to be processed in Algeria. Syapco planned to resume its program in the fall of 1971 with coverage of a 700-square-mile area running northeast of Tarfit to the Dhofar (Oman) border and then north to the Rub 'al Khali.

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[10] Prepared by David A. Carleton.

Under a general economic agreement signed in August 1971, Romania will assist in prospecting for minerals and will participate in the work of Syapco. Reportedly, the People's Republic of China's team recently carried out geological work in the eastern Hadhramant; however, results have not been published.

Salt production, the only primary mineral, produced declined considerably based on exports to Japan. In 1971, Japan received only 24,739 tons of evaporated salt compared with 41,734 tons in 1970.

Table 7.—People's Democratic Republic of Yemen: Exports and reexports of mineral commodities

Commodity	1969	1970[r]	1971
Petroleum refinery products:			
Gasoline .... thousand 42-gallon barrels	1,625	1,500	1,765
Kerosine and jet fuel .... do	6,194	7,770	5,136
Distillate fuel oil .... do	4,397	7,970	4,000
Residual fuel oil .... do	26,011	21,960	11,010
Other including LPG and feedstocks .... do	1	2,250	1,792
Total .... do	38,228	41,450	23,703
Salt[1] .... metric tons	57,668	41,734	24,739

[r] Revised.
[1] Japanese imports from the People's Democratic Republic of Yemen.

QATAR[11]

On September 3, 1971, Qatar became an independent nation when officials of both Qatar and the United Kingdom signed a Treaty of Friendship which abrogated the old special national defense and foreign affairs treaty. Qatar's independence has had little impact on the country's petroleum dominated economy. Factors weighing most heavily on the mineral economy have been the recent price increases, made effective February 15, 1971, through the auspices of OPEC, and the Government policy of industrial diversification.

In 1971 petroleum accounted for 65 to 75 percent of Qatar's gross domestic product and supplied more than 90 percent of government revenue. Government revenue in 1971 was $225 million[12] compared with $120 million in 1970.

Recently Qatar launched a diversification program, intended to reduce dependence on oil recovery as a primary source of national income and to implement national self-sufficiency. A major scheme in the program is a $60 million project to export liquefied petroleum gas. The project which was announced during March 1971 will take 3 years to complete and will have a capacity of 800,000 tons per year of liquid gases. It will be undertaken by Qatar Petroleum Co., Ltd. (QPC), using associated natural gas from the Dukhan oilfield. The project will include the construction of compression facilities at the oilfield, a 60-mile pipeline for transporting the liquids to Umm Said's export terminal, and units for separating propane, butane, and other liquids. After separation of the liquid components, the dry gas (methane and ethane) will be supplied to the fertilizer plant under construction at Umm Said. The main market for the propane and butane will be Japan.[13]

Under the agreement, QPC will supply, without charge, all the Dukhan gas required to meet Government needs.[14]

Construction of the Qatar Fertilizer Co.'s $67.7 million ammonia-urea project at Umm Said continued during the year and is expected to be completed during 1972. The company, which is 63 percent owned by the Government, is supported financially by six British banks to the extent of $37.8 million and several other British firms including a British-Norwegian plant contractor.

During December 1971, a $10.9 million contract for expanding the Umm Bab cement plant was awarded to Tarmac Construction Co., a British firm. The addition to be built for Qatar National Cement Co. will have a capacity of about 120,000 tons per year.[15]

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[11] Prepared by David A. Carleton.

[12] Where necessary, values have been converted from Qatari-Dubai rials (QDR) to U.S. dollars at the rate of 1 QDR=US$0.2105.

[13] Middle East Economic Survey. V. 14, No. 21, Mar. 19, 1971, p. 6.

[14] Financial Times. No. 25,585, Oct. 22, 1971, p. 17.

Qatar's crude oil production, which had been increasing less than 5 percent annually during the past 5 years, surged ahead by 19 percent in 1971. Production rose from 362,893 barrels per day in 1970 to 429,815 barrels per day in 1971.

Although both producing companies in Qatar, QPC and Shell Oil Co. of Qatar (Shell), increased their output, Shell registered the larger gains and for the first time surpassed production of the former. Shell's substantial increase, 20 percent, was the result of a program begun in September 1970 to increase the offtake of Maydam Mahzam field. The number of producing wells in this field were increased by three. Shell plans to significantly increase production in 1972 when the offshore Bul Hanine field comes onstream at an initial rate of 100,000 barrels per day, increasing after 1 year to 150,000 barrels per day. This means that by 1973 Qatari output could be almost twice that of 1970.

During 1971, the development of Bul Hanine field at a cost of $42 million has been the main concentration of activity. Construction of production and gas-oil separation platforms and the 20-inch pipeline to the Halul Island terminal were virtually complete at yearend. Shell also expanded its Halul terminal facilities by installing the world's largest single-point mooring buoy about 6 miles south of the island. The 250-ton buoy which can berth tankers up to 500,000 deadweight tons was assembled in Dubai from U.S.-manufactured components.

QPC's production of 207,494 barrels per day was 9 percent higher than in 1970, the result of a strong marketing position for Middle East crude as well as a successful well-acidizing program, the completion of several development wells, and a successful pressure maintenance program by increasing water injection.

The Japanese-owned Qatar Oil Co., Ltd. (QOC), drilled its first exploratory well on January 18, 1971, reaching a depth of 11,500 feet on April 10, 1971. The well tested at 3,000 barrels daily, yielding a crude of 40° API gravity and 1 percent sulfur content. A second well spudded May 14, 1971, reportedly struck oil and flowed at a higher rate than the first. The structure is located in the eastern part of the concession, southwest of Bunduq field and several miles from Sharawa Island. It was reported in May, 1971, that 3 more exploration wells will be drilled in fiscal 1971 (July 1971 through June 1972) and that 6 more wells would be drilled the following fiscal year. It is anticipated that production will eventually reach between 50,000 and 100,000 barrels per day and that the crude will be exported from a terminal in or near Sharawa Island.[16]

Qatar had two other petroleum concessionaires at yearend 1971, Southeast Asia Oil and Gas Co., which held a 3,300-square-mile offshore concessions, and Belgium Oil Corp. (BOC), which obtained an onshore concession during 1971. No developments by the former company were reported during the year and the status of the concession was unclear.

On August 12, 1971, the Government issued a concession to BOC with terms similar to that issued to QOC. The area, formerly held by QPC, covers approximately 12,000 square kilometers and had a duration of 30 years. The company was to pay a signature bonus of $1.5 million and other bonuses totaling $9.5 million if oil is found and when production reaches 200,000 barrels per day. A sliding-scale, fully expensed royalty in accordance with the OPEC formula will start at 12.5 percent and rise to 15 percent when 200,000 barrels per day is reached. The tax is 55 percent of annual profits. Relinquishment covers 30 percent of the area after 5 years, rising to a total of 70 percent 20 years after the effective date of Jan. 1, 1972.

After years of trying to persuade the QPC and Shell into building or expanding the Umm Said refinery, the Qatar Government has signed a contract with a subsidiary of the United States firm J. Ray McDermott and Co. Inc. for the construction of a 6,000-barrel-per-day refinery at Umm Said. The plant is being built for the State company National Oil Development Co. (NODCO), which will be responsible for exporting the 3,000 barrels per day above Qatar's domestic requirements.

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[15] Middle East Economic Survey. V. 25, No. 10, Dec. 31, 1971, p. 7.

[16] Japan Petroleum Weekly. May 17, 1971, p. 7.

Table 8.—Qatar: Exports of crude petroleum and imports of petroleum refinery products

(Thousand 42-gallon barrels)

Commodity	1969	1970	1971
EXPORTS			
Crude petroleum	129,598	131,765	156,439
IMPORTS			
Petroleum refinery products:			
Gasoline	302	311	325
Kerosine	28	20	25
Distillate fuel oil	172	200	250
Lubricants	11	r 14	10
Asphalt	124	r 43	38
Total	632	588	648

r Revised.

SYRIAN ARAB REPUBLIC[17]

The production of crude petroleum at a level of 99,896 barrels per day dominated Syria's mineral output in 1971. While the Nation produces a variety of nonmetallic minerals, output remained relatively stable with significant increases reported in production of phosphate rock as a result of development activity in the Palmyra area.

Total exports were reported at $198 million in 1971 and $203 million in 1970. Mineral commodity exports, principally crude petroleum were estimated at $36 million and $30 million, respectively.

The value of total imports was reported at $450 million in 1971 and $360 million in 1970. Mineral commodity imports contributed about one-fifth of this total or about $75 million in 1970.

Mineral commodity imports are limited in quantity but extend through a wide range of commodities. Most significant by value is iron and steel, estimated at $10 million in 1970 with East Europe as the major supply source.

The Iraq Petroleum Co. (IPC) pipeline crosses more than 300 miles of Syrian territory providing that nation with a sizable income in transit and related fees. IPC pipeline throughput in 1971 averaged 988,495 barrels per day earning Syria an estimated $60.24 million.

The Trans-Arabian Pipeline (TAPline) crosses the Syrian territory for 79 miles. Pipeline throughput was interrupted by four breaks in 1971, resulting in a total throughput loss of 2,336,000 barrels and reducing the average daily throughput to 338,361 barrels which earned an estimated $12.21 million in transit and related fees.

The bulk of Syria's crude oil production was exported, with only an estimated 35,000 barrels per day processessd at the Homs refinery. Domestic low-gravity crudes were combined with light Iraqi crude delivered via the IPC pipeline to yield 46,300 tons per day of petroleum products. Expansion of the Homs refinery from 30,000 to 54,000 barrels per day was completed by spring of 1971. During late summer sulfur recovery facilities from Syrian high-sulfur crudes were in operation at Homs. Sulfur recovery operations should yield about 30,000 tons of sulfur per year. The bulk of this output will be exported.

UNITED ARAB EMIRATES[18]

On July 18, 1971, six of the seven independent sheikhdoms of the former Trucial States formally agreed to form a federation to be called the United Arab Emirates. Included were Abu Dhabi, Dubai, Sharjah, Ajman, Fujairah, and Umm al-Qaiwain. The seventh sheikhdom, Ras al-Khaimah, was dissatisfied with the provisional constitution but early in 1972 formally became a member of the federation. Bahrain and Qatar, signatories to the original nine-member federation, have formed separate States.

Abu Dhabi.—Abu Dhabi's economic growth in recent years has been extremely rapid and is due to the government's policy of utilizing income from oil production for the welfare and development of the country. Income from oil rose from about $240 million in 1970 to about $350 million in 1971. With a population of roughly 80,000, Abu Dhabi's per capita income of $4,200 is one of the highest in the world.

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[17] Prepared by Bernadette Michalski.
[18] Prepared by David A. Carleton.

Economic development plans have been prepared in order to create a viable economic and social infrastructure. Current plans call for agricultural development, exploiting other mineral resources, expanding fisheries, and encouraging investment into commercial and industrial ventures.

Specifically, Abu Dhabi is currently studying four major industrial projects: (1) A Swiss firm was given a contract to prepare an operational study for the construction of a 200,000-ton-per-year cement plant to be built inland near the Buraimi Oasis at an estimated cost of $10.5 million; (2) Humphreys and Glasgow, Inc., a British firm, was given a contract to make a feasibility study for the design of a plant to recover sulfur from associated gas produced with the crude oil (the sulfuric acid produced would be sent to the Abu Dhabi sea water distillation plant, while the sulfur would be mainly for export); (3) a French firm has put forward a proposal to establish, in partnership with the Abu Dhabi Government, a gas-based petrochemical plant at a cost of about $13 million, envisaging a plant capable of producing 10,000 tons per year of polyvinyl chloride, 15,400 tons per year of caustic soda, and 9,500 tons per year of calcium diphosphate; and (4) a Dubai contracting firm has been asked to negotiate with a British firm to arrange a feasibility study which envisions a major gas-powered aluminum plant in Abu Dhabi having a capacity of 200,000 tons per year, located on Sir Bani Yas island and requiring an investment of $200 million.[19]

On September 6, 1971, Iran and Abu Dhabi initialed an agreement concerning the demarcation of an offshore boundary. Reportedly the median line dividing the offshore area was calculated in accordance with the shore-to-shore principal, without taking into account intervening islands.

Abu Dhabi petroleum production in 1971 totaled 341,004,000 barrels (934,258 barrels per day), up a substantial 35 percent from 1970. Output of Abu Dhabi Petroleum Co., Ltd. (ADPC), the country's principal producer amounted to 574,958 barrels per day. This was an increase of 38 percent over 1970 production, a rate only slightly higher than that of the country's other producer, Abu Dhabi Marine Areas, Ltd. (ADMA). All of ADPC's production came from the Murban oilfield (including Bab and Bu Hasa domes); however, production from Asab field (formerly Abu Jidu) will be possible in about 1974, following the construction of a 26-inch pipeline to the coast.

Exploration drilling at Zarrara in the far south has been suspended pending boundary discussions with Saudi Arabia. The Zarrara discovery is on the same structure as the Shaybah field found by the Saudi Arabia concessionaires, Arabian American Oil Co. (ARAMCO). Offshore (within the 3-mile limit) the Muhaiyimat well was abandoned at a depth of 6,125 feet and a new well at Hail is being drilled. The Hail well had reached 11,600 feet at yearend and after perforating and acidizing produced only a small quantity of sour gas. Principal ADPC development work included main-line and spur-line looping which will increase the company's deliverability to more than 800,000 barrels per day.

All ADMA's production comes from the offshore Zakum and Umm Shaif fields. Another field, Nasr, north of Das Island is being evaluated. Other ADMA developments include planning for a second well at Umm Addalkh, analyzing a fourth well at Sath al Raazboot, and shutting-in the Abu al Bukhoosh well, believed to be an extension of Iran's Sassan field.

During the year, the West German consortium, Deutsche Erdölversorgungsgesellschaft, m.b.h. (Deminex), engaged in negotiations with British Petroleum Co., Ltd. (BP), which owns one-third of ADMA for the purchase of a share of the BP interest. Because of the possibility of the Abu Dhabi Government gaining a share in the company as a result of 1972 OPEC negotiations, the Deminex offer was pending.

The offshore Mubarraz field of Abu Dhabi Oil Co., Ltd. (ADOCO), a Japanese consortium, is expected to come on stream toward the end of 1972 at a rate of about 50,000 barrels per day, to be doubled by

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[19] Middle East Economic Survey. V. 14, No. 35, June 25, 1971, p. 3.

1974. The field so far has six wells which yield 3,000 to 5,000 barrels per day each, the crude having a gravity of 33° to 41° API and a sulfur content of 0.7 to 1.7 percent. Developments at the offshore Dalma field were not reported for 1971. The 1970 discovery well produced 4,000 barrels per day of a light, low-sulfur crude and 18 million cubic feet per day of natural gas.

Reportedly, the Bunduq field which straddles the offshore Qatar-Abu Dhabi boundary and is being developed by Bunduq Oil Co., a consortium owned equally by British, French, and Japanese interests, will come on stream early in 1973 at a rate of 40,000 barrels per day.

Phillips Petroleum Co., operator of a 13,000-square-kilometer onshore concession it holds with other United States and Italian interests, was evaluating its Zayghat find of 1969. Twenty-five percent of the concession area will be relinquished early in 1972.

Amerada Hess Corp., which was brought into the Pan Ocean Oil Corp. consortium early in 1971 and became the operator, abandoned its first wildcat after testing noncommercial gas shows. The well, located just west of the offshore Dalma discovery by ADOCO reached a depth of 12,564 feet. The company plans to carry out new seismic work before starting further drilling. Percentage ownership of the consortium is as follows: Amerada Hess Corp., 31.5; Pan Ocean Oil Corp., 31.5; and the Canadian firms Bow Valley Industries, 20; and Wington Enterprises, 17.

The Japanese group Middle East Oil Co., which is operated by Mitsubishi Oil Co. Ltd. and has Getty Oil Co. ownership, drilled a well in 1970; however, no discoveries have been announced.[20]

Dubai.—After a slow and uncertain 1970, the Emirate of Dubai, long dependent on entrepôt trade, established itself as an important petroleum producer and in 1971 was developing a potential to triple its output which amounted to 125,070 barrels per day in 1971.

Government revenues, which amounted to $32 million in 1970, reached an estimated $70 million in 1971. This income is being used for the construction of a $58 million harbor which will offer facilities unsurpassed in the region. A hospital and international airport are other projects already embarked upon.

All crude oil production came from the offshore Fateh field operated by Continental Oil Co. (Conoco) for its partners which include West German, French, Spanish, as well as other United States interests. In 1971 a program began to increase production to at least 300,000 barrels per day by 1973. The program includes further drilling in the Fateh field and development of the Southwest Fateh field. Two rigs, one in each field were in operation during the year. The latter field will be connected to the former by a 10-mile pipeline. Two 500,000-barrel submerged tanks were under construction at yearend and will be installed next to the initial tank, presently in service in the Fateh field. A second monobuoy also will be installed with a capacity of 100,000 barrels per hour. During the year, 420 square miles of the concession area were relinquished in accordance with the concession terms.[21]

A land concession was held by three of the offshore participants, Conoco, Sun Oil Co., and Deutsche Texaco, A.G. Other offshore and onshore concessions are held by Buttes Gas and Oil Co. and Clayco Petroleum Corp., both small United States companies; however, no drilling has been reported in either concession area.

Sharjah, Ajman, and Umm al-Qaiwain.—The Buttes-Clayco partnership in Dubai also has an offshore concession with the Ruler of Sharjah; however, offshore boundaries have been the subject of an intense controversy. During 1970, Sharjah declared the width of its territorial waters to be 12 miles instead of 3 miles, as had several other Persian Gulf States. This, however, when applied to the island of Abu Musa which Sharjah claimed, conflicted with the concessions rights award by Umm al-Qaiwain to Occidental Oil Co. Both companies were prohibited from drilling by the United Kingdom, then the protecting power.

The dispute was complicated by the Iranian claim to sovereignty over Abu Musa, predating the United Kingdom treaties with Sharjah. On the withdrawal of the United Kingdom protectorship as planned, the Ruler of Sharjah and the Government of Iran concluded an agreement in November 1971 by which Iran occupied part of the island and any oil revenues which will become available will be shared between the two countries. Furthermore, Iran is to grant Sharjah nearly $4 million per year until such time as the latter has an annual oil income of $7.8 million per year. On conclusion of this agreement, Sharjah and Iran confirmed the Buttes-Clayco rights but Occidental contested the decision. Before yearend 1971, Buttes-Clayco announced that it expected to drill its first well within 12 miles of Abu Musa during early 1972.

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[20] Petroleum Press Service. V. 39, No. 1, Jan. 1972, pp. 7–9.

[21] Continental Oil Company. Annual Report 1971.

Shell Hydrocarbons, N.V., relinquished its concession rights to Sharjah and Umm al-Qaiwain effective yearend 1971. Since obtaining the rights, which included onshore and offshore Sharjah and onshore Umm al-Qaiwain, Shell had two onshore dry holes, Al Faya No. 1 in Sharjah and Mualla No. 1 in Umm al-Qaiwain.

No developments were reported on the Occidental Oil Co. concession which covers the total of Ajman's onshore and offshore area.[22]

Fujairah.—At the time Shell Hydrocarbons, N.V., relinquished its other United Arab Emirates' concessions, the company and Bochumer Mineralölgesellschaft G.m.b.H. and Co. (Bomin) relinquished their joint onshore rights in Fujairah. No developments were reported for the year.

Ras al-Khaimah.—The seventh member of the United Arab Emirates, whose membership was not confirmed until February 1972, has perhaps the best prospects for becoming an oil producer. Union Oil Co. of California, which owns 80 percent of an onshore-offshore concessions with Southern Natural Gas Co. (20 percent), completed its third well on a prospect 30 miles offshore. The two previous wells ran into technical trouble, although the second well had been drilled to 14,000 feet. The Union Oil Co., which has spent $13 million in Ras al-Khaimah, continues to be optimistic about the area and has announced that it is carrying out extensive tests to determine the extent of hydrocarbon shows.[23]

YEMEN [24]

The Government of Yemen concluded an agreement on July 28, 1971, with the Kuwait Fund for Arab Economic Development (KFAED) and the International Bank for Reconstruction and Development (IBRD), whereby Yemen will receive a $400,000 grant to finance a technical team to survey the possibilities for economic development. The team will assist the Government in developing its basic economic structure by introducing improvements in planning techniques and drawing up a development program. The team of four will spend 2 years in Yemen.

The Salif Salt Mining Co. was apparently able to increase its production in 1971 based on the quantities delivered to Japan, the company's only customer. Of the 100,000 tons per year contracted to be shipped to Japan, 86,202 tons were received in 1971 compared with 79,386 tons in 1970.

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[22] Work cited in footnote 20.
[23] Work cited in footnote 20.
[24] Prepared by David A. Carleton.

The Mineral Industry of Other Far Eastern and South Asian Areas

By Staff, Bureau of Mines

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		South Vietnam	1099

AFGHANISTAN [1]

Afghanistan remains one of the less developed countries of the world and its only minerals industry is based almost entirely on natural gas from the Shibarghan Province gasfield. Natural gas production rose from 18 billion cubic feet in 1967 to nearly 100 billion cubic feet in 1971. During 1971, Afghanistan exported 88.7 billion cubic feet of natural gas to the U.S.S.R. under the existing reciprocal trade agreement signed between these countries in 1967. Additional natural gas was shipped to Kabul, a thermal power station at Pul-i-Emermbukry, and the chemical complex that has been under construction near Mazar-i-Sharif. Domestic industrial demand for natural gas is limited, and the country is dependent mainly on exports for its market. Production was supplied from 28 wells. The producing fields have proven recoverable gas reserves amounting to 1,465 billion cubic feet. Unproven reserves are estimated at 1,006 billion cubic feet and do not include an additional 1,059 billion cubic feet of sour gas.

Production of coal continued during the year with the bulk coming from the Karkar, Ishpushta, and Darri-i-Suf mines. Afghanistan's output of coal did not show a great change from the quantity reported for 1970. Production has been increasing slowly. Factors such as the remote location and poor transportation facilities continue to hamper the rapid development of the

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[1] Prepared by Benjamin Petkof, physical scientist, Division of Nonmetallic Minerals.

Table 1.—Other Far Eastern and South Asian Areas: Production of mineral commodities

(Metric tons unless otherwise specified)

Area,[1] commodity, and unit of measure	1969	1970	1971 [p]
AFGHANISTAN [2] [3]			
Cement, hydraulic ---- thousand metric tons	[r] 104	94	[e] 90
Coal:			
Bituminous, mine output ---- do	136	170	[e] 180
Briquets (produced from a part of mine output) ---- do	23	30	NA
Gas, natural, marketed production [4] ---- million cubic feet	71,653	91,217	[e] 95,000
Gem stones, lapis lazuli ---- kilograms	[r] 4,500	10,000	[e] 10,000
Stone:			
Marble "traso" ---- thousand cubic meters	24	27	NA
Marble, n.e.s ---- do	6	5	NA
Salt, all types ---- thousand metric tons	37	38	[e] 38

See footnotes at end of table.

Table 1.—Other Far Eastern and South Asian Areas: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Area,[1] commodity, and unit of measure	1969	1970	1971 [p]
BRUNEI [2]			
Gas, natural:			
Gross production ... million cubic feet	123,266	126,654	123,643
Marketable production ... do	7,655	7,965	[e] 8,000
Natural gas liquids:			
Condensate ... thousand 42-gallon barrels	15	16	NA
Natural gasoline ... do	489	465	NA
Liquefied petroleum gas ... do	210	207	NA
Petroleum:			
Crude ... do	45,624	50,233	47,482
Refinery products:			
Gasoline ... do	108	93	[e] 98
Distillate fuel oil ... do	184	218	[e] 216
Residual fuel oil ... do	5	2	[e] 4
Other ... do	7	15	[e] 14
Refinery fuel and losses ... do	([6])	45	[e] 48
Total ... do	[6] 304	373	[e] 380
Stone, gravel and cobblestone ... cubic meters	NA	340,657	NA
CEYLON			
Cement, hydraulic ... thousand metric tons	283	326	385
Coke, gashouse ... metric tons	10,584	10,434	7,861
Clays:			
Ball ... do	NA	1,333	226
Kaolin ... do	3,084	2,209	3,165
Other ... do	[6] 71,543	130,000	[6] 66,000
Feldspar, crude and ground ... do	604	1,293	258
Gem stones, precious and semiprecious, except diamond [7] ... thousand carats	225	NA	126
Graphite, all grades [7] ... metric tons	11,418	9,787	7,186
Mica, scrap [7] ... do	--	468	315
Petroleum refinery products:			
Gasoline ... thousand 42-gallon barrels	385	1,219	966
Jet fuel and kerosine ... do	476	2,069	1,686
Distillate fuel oil ... do	873	3,170	2,474
Residual fuel oil ... do	[r] 1,383	4,652	4,472
Other ... do	332	1,160	808
Refinery fuel and losses ... do	390	964	1,030
Total ... do	[r] 3,839	13,234	11,431
Rare-earth minerals, monazite concentrate, gross weight ... metric tons	56	16	6
Salt, marine ... do	113,703	64,570	86,144
Sand and gravel, glass sand ... do	3,417	5,361	2,607
Stone:			
Dolomite ... do	5,700	3,408	NA
Limestone ... thousand metric tons	[6] 375	511	551
Quartz, massive ... metric tons	1,565	2,392	1,531
Titanium:			
Ilmenite concentrate, gross weight ... do	82,855	84,558	92,892
Rutile concentrate, gross weight ... do	2,755	[e] 2,800	[e] 3,100
Zirconium concentrate, zircon, gross weight ... do	68	112	139
HONG KONG [2]			
Cement, hydraulic ... thousand metric tons	378	430	512
Clays, kaolin ... metric tons	4,411	3,785	2,540
Feldspar ... do	1,940	1,621	1,145
Graphite, all grades ... do	199	--	--
Iron ore and concentrate ... do	165,946	170,256	162,739
Quartz ... do	6,317	5,350	5,141
KHMER REPUBLIC [2]			
Cement, hydraulic ... thousand metric tons	59	39	59
Gem stones:			
Ruby ... carats	NA	NA	1,612
Sapphire ... do	NA	NA	879
Zircon ... do	NA	NA	1,630
Gold, mine output, metal content [e] ... troy ounces	4,000	4,000	4,000
Petroleum refinery products:			
Gasoline ... thousand 42-gallon barrels	292	256	21
Jet fuel ... do	110	183	--
Kerosine ... do	183	146	--
Distillate fuel oil ... do	1,059	803	82
Residual fuel oil ... do	657	365	43
Other ... do	511	365	14
Refinery fuel and losses ... do	219	137	51
Total ... do	3,031	2,255	211
Phosphate rock ... metric tons	NA	NA	16,011
Salt [e] ... do	[r] 130,000	130,000	130,000
Sand (silica) ... do	NA	NA	2,200
LAOS [2]			
Salt, rock ... do	2,400	1,169	400
Tin, mine output:			
Gross weight of concentrates ... long tons	1,242	1,358	1,548
Metal content of concentrates ... do	621	679	774

See footnotes at end of table.

Table 1.—Other Far Eastern and South Asian Areas: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Area,[1] commodity, and unit of measure	1969	1970	1971 [p]
MONGOLIA [2]			
Cement, hydraulic [e] ... thousand metric tons	[r] 72	67	70
Coal, all grades ... do	[r] 1,649	1,999	2,086
Fluorspar, all grades [e] ... metric tons	78,000	80,000	80,000
Gypsum [e] ... do	25,000	25,000	25,000
Lime, quicklime and hydrated [e] ... do	40,000	40,000	40,000
Petroleum:			
Crude [e] ... thousand 42-gallon barrels	90	90	90
Refinery products:			
Gasoline ... do	[r] 102	128	[e] 130
Jet fuel and kerosine ... do	62	62	[e] 65
Distillate fuel oil ... do	[r] 52	52	[e] 55
Residual fuel oil ... do	[r] 173	173	[e] 175
Total [8] ... do	[r] 389	415	[e] 425
Salt [e] ... metric tons	8,000	8,000	8,000
SINGAPORE [2]			
Cement, hydraulic ... thousand metric tons	623	726	613
Iron and steel:			
Crude steel ... do	--	--	124
Semimanufactures (rolled only) ... do	NA	NA	161
Petroleum refinery products:			
Gasoline ... thousand 42-gallon barrels	8,554	11,169	15,809
Jet fuel ... do	11,387	8,094	14,808
Kerosine ... do	3,837	1,918	4,848
Distillate fuel oil ... do	11,675	13,127	19,232
Residual fuel oil ... do	8,374	33,850	53,566
Lubricants ... do	355	375	2,553
Asphalt ... do	680	1,203	2,062
Other ... do	20,004	603	
Refinery fuel and losses ... do	2,457	4,568	7,226
Total ... do	67,323	74,907	120,104
Stone, granite ... thousand cubic meters	NA	1,496	1,664
Sulfur, byproduct from oil refining ... metric tons	NA	NA	685
VIETNAM, NORTH [9]			
Cement, hydraulic [e] ... thousand metric tons	500	500	500
Coal, anthracite [e] ... do	3,000	3,000	3,200
Fertilizer materials, crude, phosphatic:			
Apatite [e] ... do	[r] 600	[r] 500	700
Phosphate rock [e] ... do	50	50	55
Salt [e] ... do	150	150	150
VIETNAM, SOUTH			
Cement, hydraulic ... do	247	286	263
Clays:			
Kaolin [e] ... metric tons	1,000	1,000	1,000
Other ... do	[e] 130,000	NA	NA
Laterite [10] ... do	[e] 500,000	NA	NA
Salt, marine ... do	118,319	[e] 120,000	120,000
Sand and gravel:			
Silica sand ... thousand metric tons	NA	NA	5
Other sand and gravel ... do	NA	8,002	NA
Stone:			
Basalt, rhyolite ... metric tons	[e] 15,000	NA	NA
Granite and porphyry ... thousand metric tons	NA	12,338	NA
Limestone ... do	NA	286	NA
Sandstone ... do	[e] 370	NA	NA
Schist ... do	[e] 140	NA	NA

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to the countries listed individually in this table, Nepal, covered textually in this chapter, presumably produces a variety of crude construction materials, such as clays, stone, and sand and gravel, and may have initiated cement production in 1969, but no production data are available and general information is inadequate to make reliable estimates of output levels.

[2] In addition to the commodities listed, a variety of crude construction materials, such as clays, stone, and sand and gravel presumably were produced, but production statistics are not available and general information is inadequate to make reliable estimates of output levels.

[3] Data are for years beginning March 21 of that stated.

[4] Gross production not reported, but presumably exceeds marketed production by only a small quantity.

[5] Available sources do not indicate any refinery fuel and/or losses; presumably total is deficient by this quantity.

[6] For cement production only.

[7] Exports.

[8] Total of listed figures only, no allowance is made for other products (if any) nor for refinery fuel and losses.

[9] In addition to the commodities listed, chromite, iron ore, lead-zinc ores, and tin ore were mined in the past and the country produced pig iron, crude steel, and smelter zinc from its industrial facilities, but the status of these industries under prevailing war conditions is not sufficiently clear to permit preparation of reliable estimates of output. Similarly, no data on crude construction materials is available and no reliable basis for estimation is available.

[10] As reported, use unspecified.

Darri-i-Suf coal mine, largest in the country with reserves of possibly 60 million tons.

The Hajigak iron deposits located in central Afhanistan were surveyed during the year by a team of Afghan and Soviet mineral experts who reported that the deposits contained over 1 billion tons of iron ore with an iron content ranging from 58 to 72 percent. A French firm, Schneider, was preparing mining and marketing feasibility studies of the Hajigak hematite deposit at yearend.

The remaining known mineral production consisted of lapis lazuli, cement, and salt. A substantial quantity of cement was manufactured.

No progress was reported in the revision of the country's mining and petroleum code during the year.

Table 2.—Afghanistan: Imports of petroleum refinery products

(Thousand 42-gallon barrels)

Commodity	1969 •	1970	1971 •
Gasoline:			
Aviation	128	70	73
Other		710	1,170
Jet fuel	39	73	85
Kerosine	113	173	183
Distillate fuel oil	39	630	949
Residual fuel oil	4	183	180
Lubricants	1	29	36
Other	52	37	44
Total	376	1,905	2,720

• Estimate.

BRUNEI [2]

Production of petroleum, Brunei's only commercial mineral commodity, declined slightly in 1971. However, construction of the liquefied natural gas plant was underway, and the plant was expected to come onstream by late 1972. Shell Oil Co. and Ashland Oil, Inc. continued their offshore exploration programs, but no important discoveries were reported.

PRODUCTION

Petroleum remained Brunei's only significant mineral product in 1971. Production of liquefied natural gas was not scheduled to begin until late 1972. Output of petroleum was 47,482,000 barrels, a decline of 5 percent from the 50,233,000 barrels produced in 1970. Offshore wells accounted for more than one-half of the 1971 production. Output of the refinery at Seria was not reported but was estimated to be at about the level of 1970 production. Sales of natural gas for local use were also unreported.

Data on value of the country's mineral production for 1971 were not officially published, but the total value probably declined from that of 1970 owing to the drop in petroleum and natural gas liquids output. Reported production values for individual commodities in 1970 follows in thousand dollars:

Crude petroleum (less refinery input)	90,229
Refined petroleum products	1,098
Natural gas sales	158
Natural gas liquids	1,024
Other commodities (estimated)	1,775
Total	94,284

Physical quantity data for 1969 through 1971 are shown in table 1.

COMMODITY REVIEW

Natural Gas.—Additional contracts and agreements during 1971 substantially increased the probable exports of natural gas to Japan. In February the three consumers of liquefied natural gas—Tokyo Electric Power Co., Tokyo Gas Co., and Osaka Gas Co.—raised their planned annual purchases from 190 billion cubic feet to 270 billion cubic feet, an increase of 42 percent. (These are approximate amounts converted from metric tons.)[3] Later in the year provisional agreement was reached for the sale of 6 million barrels of natural gasoline per year to Kansai Power Co. of Himeji, Japan. Shipments would commence in 1973 or 1974 and continue for 20 years.[4]

Site preparation for the liquefaction plant was completed and construction was underway in 1971. Two separate cryogenic heat exchanger systems designed by Air Products & Chemicals, Inc., will be used for liquefaction, one employing a propane refrigerant and the other a multicomponent refrigerant. Acid gas removal will be carried out by a Shell process prior to liquefaction. The liquid gas will be carried from storage tanks to the tanker loading platform 3 miles offshore by means of two

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[2] Prepared by David G. Willard, economist, Division of Nonmetallic Minerals.

[3] Petroleum Press Service. Brunei. V. 38, No. 10, October 1971, p. 395.

[4] Petroleum Press Service. Japan. V. 38, No. 3, March 1971, p. 115.

18-inch insulated pipelines over a "trestle bridge" of steel pipe piles. Six tankers, on order from Chantier de L'Atlantique of St. Nazaire, France, will make the round trip to Japan in about 14 days. A construction labor force of between 1,000 and 2,500 men was employed on the project during 1971. First deliveries are expected to take place in late 1972 or early 1973.[5]

Petroleum.—Exploration activity was confined to the offshore concessions in 1971. The only reported drilling was done by Shell Oil, but no important discoveries were made.[6] Ashland Oil, operator of the other offshore concession, completed a geophysical program which indicated the presence of drillable prospects. The decision whether to drill was to be made shortly.[7]

CEYLON[8]

Ceylon's mineral industries, headed by titanium concentrates, clays, graphite, gem stones, and salt, contributed significantly to the country's economy. The bulk of the titanium concentrates, graphite, and gem stones was produced for export. Ceylon imported crude petroleum for processing into refined petroleum products for export and domestic consumption.

Natural graphite production, for which Ceylon is world renowned, declined 27 percent, to 7,186 tons valued at $1.5 million in 1971.[9] Graphite exports totaled 7,754 tons in 1971, destined primarily for Japan, the United States, and the United Kingdom. During the year, the Government nationalized the graphite industry by vesting control of the Nation's largest graphite mines in the State Graphite Corp. The Government claimed that the country's declining domestic graphite production has caused traditional buyers of Ceylon graphite to seek other sources of this material. Declining graphite production may also be caused by Ceylon's land laws that do not allow mines to be worked beyond specified geographic boundries. This requires operations at greater depths, which substantially increases mining costs.

Titanium concentrate production increased in importance to the development of the Nation's mineral industry. The State-owned Ceylon Mineral Sand Corp. has received approval for a $4.15 million loan and technical assistance grant from the Asian Development Bank to improve

Table 3.—Ceylon: Exports and reexports of mineral commodities

Commodity	1969[1]	1970[2]	Principal destinations, 1970
METALS			
Ilmenite metric tons	84,700	79,212	Japan 78,075; Italy 630; United Kingdom 254.
NONMETALS			
Graphite, natural do	11,419	7,724	Japan 3,495; United States 2,273; United Kingdom 1,176.
Mica, all forms do	396	NA	
Precious and semiprecious stones (except diamond) carats	[3] 217,040	[4] $4,710	Japan $3,205; United States $840; France $323.
MINERAL FUELS AND RELATED MATERIALS			
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	--	125	All to United Kingdom.
Refinery products:			
Gasoline 42-gallon barrels	193	788,145	All to Japan.
Kerosine do	3,052	NA	
Distillate fuel oil do	1,351	NA	
Residual fuel oil do	NA	255,264	Australia 128,251; United Kingdom 127,013.
Lubricants do	104	NA	

NA Not available.

[1] Customs Department of Ceylon. Ceylon Trade 1969, Colombo 1970, 933 pp.

[2] Statistical Office of the United Nations. Supplement to the World Trade Annual, 1970. V. 5 (The Far East), Walker and Company, New York, 1972, pp. 169–172.

[3] Includes an unspecified quantity valued at $22,889.

[4] No tonnage figure reported but an unspecified quantity valued as indicated was exported.

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[5] Europe & Oil. The Brunei LNG Project and Process Report. V. 10, No. 4, April 1971, p. 18.

[6] Petroleum Press Service. Probing the South China Sea. V. 38, No. 6, June 1971, p. 207.

[7] Ashland Oil, Inc. Annual Report, 1971, p. 17.

[8] Prepared by Benjamin Petkof, physical scientist, Division of Nonmetallic Minerals.

[9] Where necessary, values have been converted from the Ceylonese rupies (Cey Rs) to U.S. dollars at the rate of Cey Rs5.95237=US$1.00.

Table 4.—Ceylon: Imports of mineral commodities
(Metric tons unless otherwise specified)

Commodity	1969 [1]	1970 [2]
METALS		
Aluminum:		
Oxide and hydroxide	r [3] 10	NA
Metal including alloys, all forms	[4] $2,520	903
Chromium oxides and hydroxides	r 7	NA
Cobalt oxides and hydroxides	(5)	NA
Copper including alloys, all forms	[4] $1,176	504
Iron and steel:		
Ore and concentrate	[3] 93	NA
Pig iron, ferroalloys, and similar materials	521	886
Steel, primary forms	[3] 27,082	NA
Semimanufactures:		
Bars, rods, angles, shapes, and sections	r 28,499	4,441
Universals, plates, and sheets	[3] 27,385	9,849
Hoops and strips	2,947	2,284
Rails and accessories	129	2,579
Wire	3,303	3,744
Tubes, pipes, and fittings	[4] $1,377	1,227
Castings and forgings, rough	[4] $9	119
Lead:		
Oxides	7	NA
Metals including alloys, all forms	401	383
Manganese oxides	698	[4] $26
Mercury 76-pound flasks	16	NA
Molybdenum	[4] $2	NA
Nickel including alloys, all forms	[4] $58	NA
Rare-earth metals:		
Oxides kilograms	436	NA
Metals including alloys, all forms do	2,947	NA
Silver, all forms, including alloys troy ounces	[4] $153	NA
Tin, all forms, including alloys long tons	r [3] 321	NA
Titanium oxides	196	NA
Tungsten including alloys, all forms	6	NA
Zinc:		
Oxides	306	128
Metal, all forms, including alloys	1,950	796
Others:		
Ores and concentrates of base metals, n.e.s	93	277
Oxides, hydroxides, and peroxides of metals, n.e.s	358	[4] $222
Metals including alloys, all forms, n.e.s	[3] 11	NA
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc.	22	NA
Grinding and polishing wheels and stones	96	30
Asbestos	6,843	4,139
Barite	3	NA
Boron materials:		
Crude natural borates	278	NA
Oxide and acid	26	NA
Cement	130,518	[6] 31,512
Chalk	1,210	NA
Clays and products (including refractory brick):		
Crude n.e.s	1,850	634
Products	827	1,293
Diatomite and other infusorial earths	60	NA
Fertilizer materials:		
Crude:		
Nitrogenous	544	NA
Potassic	25	NA
Other	878	NA
Manufactured:		
Nitrogenous	128,763	111,951
Phosphatic	39,499	NA
Potassic	46,016	79,753
Other including mixed	3,950	14,746
Gypsum and plasters	3,658	[4] $31
Lime	1,078	NA
Magnesite	34	NA
Mica, all forms	29	25
Pigments, mineral including processed iron oxides	408	112
Salt and brine	187	NA
Sodium and potassium compounds, n.e.s	2,794	2,000
Stone, sand and gravel:		
Dimension stone	15	[4] $39
Dolomite, chiefly refractory grade	23	NA
Gravel and crushed rock	468	NA
Quartz and quartzite	3	NA
Sand excluding metal bearing	41	NA

See footnotes at end of table.

Table 4.—Ceylon: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969[1]	1970[2]
NONMETALS—Continued		
Sulfur:		
Elemental, all forms	976	NA
Sulfuric acid	682	NA
Talc, steatite, soapstone, and pyrophyllite	1,346	NA
Other nonmetals, n.e.s.:		
Crude	852	3,972
Slag and ash, including kelp	32	NA
Oxides and hydroxides of magnesium, strontium, etc	27	NA
Building materials of asphalt, asbestos and fiber, cement and unfinished metals, n.e.s	360	NA
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	1,346	NA
Carbon black and gas carbon	1,130	856
Coal and coke including briquets	21,632	11,383
Gas, hydrocarbon	4	NA
Hydrogen, helium, and rare gases	5	NA
Petroleum:		
Crude and partly refined thousand 42-gallon barrels	(5)	13,206
Refinery products:		
Gasoline (including natural) do	706	[7] 278
Kerosine and jet fuel do	1,452	[7] 490
Distillate fuel oil do	2,921	[7] 555
Residual fuel oil do	5,388	[7] 840
Lubricants do	114	78
Mineral jelly and wax do	(5)	--
Others, n.e.s do	44	[7] 40
Mineral tar and other coal–, petroleum–, or gas–derived crude chemicals	[3] 79	[4] $58

[r] Revised. NA Not available.

[1] Customs Department of Ceylon, Ceylon Trade 1969, Colombo, 1970, 933 pp.

[2] Statistical Office of the United Nations. Supplement to the World Trade Annual. V. 5 (The Far East), 1970, Walker and Company, New York, 1972, pp. 173–183.

[3] Source indicates that an additional unspecified quantity was imported for which only value data was reported.

[4] No tonnage figure reported but an unspecified quantity valued in thousands of dollars as indicated was imported

[5] Less than ½ unit.

[6] Source: Official Trade Statistics of India.

[7] Figure represents the quantity reported for the period January 1 to June 30 of 1970 only.

and expand the ilmenite extraction plant at Pulmoddai Beach on the northeast coast and integrate it with a rutile and zircon recovery plant that will be moved from its location at China Bay. The development program is expected to increase ilmenite output to 60,000 tons per year, rutile to 11,000 tons per year, and zircon to 9,000 tons per year by 1975. Ceylon as yet has no domestic consuming industry for these mineral commodities, and total output is intended for export. In the past Japan has been the primary market for Ceylon's titanium concentrates.

Ceylon's cement industry, under the direction of the State Cement Corp., increased its output 18 percent over that of 1970. The State Cement Corp. operates three cement plants at Puttalam, Kankesanturi, and Galle. The plants have a current total production capacity of almost 600,000 tons. The production capacity of the country will increase substantially when additional facilities are completed at the Puttalam plant. When this capacity is achieved, Ceylon will be self-sufficient for its domestic requirements of this processed mineral commodity.

The Ceylon Government Gazette of December 23, 1971, published the bylaws of the State Gem Corp. drawn up under section 21(1) of the State Gem Corp. Act No. 13 of 1971. The bylaws, effective January 1, 1972, required that no person shall be permitted to operate a mine for the purpose of finding gems, carry on business as a gem dealer or lapidary, or conduct gem auctions without first obtaining a license from the State Gem Corp. This legislation may stimulate the substitution of modern mining methods for the primitive techniques currently used to mine gem stone. Ceylon's gem stone deposits are located in the Ratnapura District and contain sapphires, rubies, tourmaline, topaz, garnets and other gem stones.

The discovery of an iron ore deposit extending to a depth of 7,000 feet and covering 100 acres was reported in the Delta area of central Ceylon. Tests indicated that the deposit had a high iron content. Indicated reserves of iron in the deposit appear to be large. If it is developed, a new mineral commodity may be added to Ceylon's mineral industry.

Ceylon currently has no producing oil or gas wells, but imports substantial quantities of crude oil for processing into various refined petroleum products such as gasoline, naphtha, kerosine, gas oil, diesel fuel, heavy fuel, and unfinished oils. During 1971, the nationalization of the oil industry was completed when the Ceylon Petroleum Corp. took control of all bunkering and any remaining distribution facilities under private control.

The existence of oil and natural gas deposits along the coastal belt of northern Ceylon was confirmed. The Ceylon Petroleum Corp. conducted a refraction seismic survey and drilled three test wells. Delineation and development of such deposits would lessen Ceylon's dependence on crude oil imports.

The mineral industry continues to provide only a small fraction of the nation's total international trade, or shown by the following tabulation detailing the relationship between mineral and total trade:

	Value (million dollars)	
	Mineral commodities (including fuels)	Total trade
Exports and reexports:		
1968	2.13	342
1969	2.24	322
1970	NA	339
Imports:		
1968	72.1	365
1969	54.1	427
1970	NA	389

NA Not available.

HONG KONG[10]

Hong Kong experienced a healthy but not phenomenal growth in 1971. The growth rate was less than in 1970. This was attributed to the general slump in trade throughout the world but particularly with the United States, Japan, and the United Kingdom. Since the United States absorbed 42 percent of Hong Kong's exports and contributed only 13 percent of the imports in 1971 interest is strong in regard to the health of the U.S. economy.

Comparing 1971 with 1970, Hong Kong's exports were up 11 percent, reexports were up 18 percent, and imports were up 15 percent. These rates were still fairly high, although lower than the 25-percent overall average achieved in the late 1960's. Hong Kong has the most trade-oriented economy in the world. Textile products account for the bulk of the exports, with mineral products accounting for perhaps 2 percent. About 14 percent of the total imports were mineral- or metal-oriented materials or products.

Hong Kong's economy, which is oriented around trade, industry, and shipping, continued to be very much affected by the supply of electric power and water necessary to support 4 million people in a congested land area of less than 400 square miles. Overall power consumption in 1971 increased to 4,912 million kilowatt-hours, from 4,551 million in 1970. Power for industry rose from 1,830 million kilowatt-hours in 1970 to 2,017 million in 1971, and power for commercial purposes from 1,673 million kilowatt-hours to 1,891 million. Generally, electric power facilities were developed as needed.

The total quantity of gas sold for domestic and industrial use in 1971 was 9.8 million therms (980,000 Btu), compared with 9.1 million therms in 1970, an increase of 8 percent. It is all imported.

Water for domestic and industrial use has always been a problem in Hong Kong, and increasing demand has forced the Government to expand supply and build costly reservoirs. To prevent dependence on imported tank supplies and water from the People's Republic of China's (PRC) controlled rivers, the Hong Kong Government plans to enlarge the current 20-million-gallon-per-day desalting plant to 40 million gallons of fresh water daily, making it the largest desalting installation in the world. The six new units are scheduled for completion by yearend 1975. In so doing, Hong Kong is also expected to cut down on imports of salt.

PRODUCTION

As of late 1971, Hong Kong had 38 mining and quarrying establishments employing 1,282 people.[11] In addition, several thousand were employed in metal fabrication. The indigenous mineral industry, which contributes little to the economy, showed a decline in output for most commodities. Only quartz production maintained its total dollar value. Output of iron ore, clay (kaolin), and feldspar declined 4, 33, and 29 percent, respectively. A drop in cement production was reported for cement in 1971, because of a slowdown in construction, but no dependable production figures were available. Hong Kong has six quarries to provide construction materials, and a small cement industry based mainly upon imported clinker. The only graphite mine in the Colony was shut down several years ago.

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[10] Prepared by H. B. Wood, mining geologist, Division of Nonmetallic Minerals.

[11] Far Eastern Economic Review. 1972 Yearbook: Hong Kong. Pp. 155–180.

TRADE

Hong Kong's total trade in 1971 was 37,420 million in Hong Kong dollars, or about US$6,175 million. the conversion rate was HK$6.06 to US$1.00, until year-end, when it was established at HK$5.58 to US$1.00. Hong Kong imports totaled US$3,342.6 million, up 15 percent over 1970; exports totaled US$2,262.2 million, up 11 percent; reexports totaled US$563.4 million, up 18 percent.

Mineral and metal-oriented products were of some significance in the overall imports. Hydrocarbons and hydrocarbon products were over 3 percent of total imports or about 22 percent of the mineral- and metal-oriented products. Nonmetallic mineral manufactures totaled 7.8 percent of the total imports. Other mineral and metal items of significance measured in terms of the percentage of total imports were as follows: iron and steel scrap and finished products 2.5 percent, and nonferrous metals 1.3 percent. As noted, minerals and metals were of little consequence in the total export trade of Hong Kong, consisting mainly of metal scrap and iron ore that was shipped from the small Ma On Shan iron mine.

In 1971 Hong Kong lost ground in trade with the PRC. This was the first time since 1966 that the PRC's exports to the Colony exceeded its imports from the Colony. This was probably due to the decline in the economic growth within Hong Kong, which started in 1970, and also to the notable rise in value of the PRC's exports. Of the mineral imports from the PRC, notable increases in value were in iron and steel, up 47 percent to $8,118,000, fuels and lubricants up 37 percent to $912,000, chemicals, up 36 percent to $17,133,000; and crude materials, up 20 percent to $27,089,000.

Table 5.—Hong Kong: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969 [1]	1970 [2]	Principal destinations, 1970
METALS			
Aluminum:			
Bauxite and concentrate	508	NA	
Oxide and hydroxide	6	NA	
Metal including alloys, all forms	10,973	2,920	United Kingdom 1,411; Japan 1,276.
Arsenic trioxide, pentoxide, and acids	19	NA	
Chromium oxide and hydroxide	8	NA	
Cobalt oxide and hydroxide	4	NA	
Copper metal including alloys, all forms	9,752	9,228	Japan 7,207; West Germany 1,346.
Gold metal, unworked or partly worked thousand troy ounces	728	NA	
Iron and steel:			
Ore and concentrate thousand tons	186	163	All to Japan.
Metal:			
Scrap do	147	70	Mainly to Japan.
Steel, primary forms do	2	NA	
Semimanufactures:			
Bars, rods, angles, shapes, sections do	85	1	Mainly to New Zealand.
Universals, plates and sheets do	6	NA	
Other do	2	NA	
Lead metal including alloys, all forms	721	NA	
Magnesium metal including alloys, all forms	1	58	All to United States.
Manganese oxide	431	NA	
Mercury 76-pound flasks	5	NA	
Nickel metal including alloys, all forms	63	118	Japan 105.

See footnotes at end of table.

Table 5.—Hong Kong: Exports and reexports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969 [1]	1970 [2]	Principal destinations, 1970
METALS—Continued			
Platinum-group metals including alloys, all forms thousand troy ounces	1	NA	
Silver metal including alloys do	764	NA	
Tin metal including alloys, all forms long tons	162	69	All to United Kingdom.
Titanium oxide	283	NA	
Zinc:			
Oxide	14	NA	
Metal including alloys, all forms	1,303	NA	
Other:			
Oxides, hydroxides, and peroxides of metals, n.e.s	7	NA	
Metals including alloys, all forms:			
Metalloids	2	NA	
Base metals including alloys, all forms n.e.s	2	NA	
NONMETALS			
Abrasives, natural n.e.s	24	NA	
Asbestos	85	NA	
Barite and witherite	85	NA	
Cement	62,390	NA	
Clays and products (including all refractory brick):			
Crude n.e.s	9,134	1,848	All to Japan.
Products	1,304	NA	
Cryolite and chiolite	3	NA	
Diamond, gem, not set or strung thousand carats	219	(3)	(3).
Diatomite and other infusorial earths	15	NA	
Feldspar and fluorspar	702	NA	
Chalk	3	NA	
Fertilizer materials:			
Crude	371	NA	
Ammonia	4	NA	
Graphite, natural	530	NA	
Gypsum and plasters	174	NA	
Lime	326	NA	
Mica, all forms	70	1	All to West Germany.
Pigments, mineral including processed iron oxide	355	NA	
Salt and brine	271	NA	
Sodium and potassium compounds, n.e.s	458	NA	
Stone, sand and gravel:			
Dimension stone	1,638	NA	
Gravel and crushed rock	24,590	NA	
Quartz and quartzite	1,822	NA	
Sulfur:			
Elemental, all forms	201	47	All to Italy.
Sulfuric acid	18	NA	
Talc, steatite, soapstone and pyrophylite	1,269	NA	
Other nonmetals, n.e.s.:			
Crude	186	NA	
Building materials of asphalt, asbestos and fiber, cement and unfired nonmetals, n.e.s	71	NA	
MINERAL FUELS AND RELATED MATERIALS			
Carbon black and gas carbon	95	NA	
Coal and coke including briquets	39	NA	
Petroleum refinery products:			
Gasoline (including natural) thousand 42-gallon barrels	28	33	NA.
Kerosine and jet fuel do	47	47	
Distillate fuel oil do	278	276	
Residual fuel oil do	10	12	
Lubricants do	132	122	
Mineral jelly and wax do	56	65	NA.
Other:			
Pitch do	(4)		
Bitumen and other mixtures do	4		
Bituminous mixtures n.e.s do	(4)		
Liquefied petroleum gas do	8		
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	4	NA	

NA Not available.

[1] Source: Census and Statistics Department, Hong Kong. Hong Kong Trade Statistics, Exports and reexports, December 1969, Hong Kong, March 1970, 720 pp.

Virtually all figures in this column revised owing to use of conversion factor for short hundred weights to metric tons in previous editions; revised data converted using factor for long hundred weights to metric tons.

[2] Source: Statistical Office of the United Nations, Supplement to the World Trade Annual, 1970. The East, v. 5. Walker and Company, New York, 1972, pp. 185–200.

[3] Value $8,627,000 of which Belgium-Luxembourg $7,511,000; Switzerland $589,000.

[4] Less than ½ unit.

Table 6.—Hong Kong: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969 [1]	1970	Principal sources, 1970
METALS			
Aluminum:			
Bauxite and concentrate	594	439	People's Republic of China 394; Japan 40; Netherlands 5.
Oxide and hydroxide	286	294	West Germany 173; Japan 85; United States 18.
Metal including alloys, all forms	22,227	23,885	Canada 6,123; Australia 5,076; Japan 4,750.
Arsenic:			
Natural sulfides	--	5	All from People's Republic of China.
Trioxides, pentoxides, and acids	77	86	People's Republic of China 81; West Germany 5.
Chromium oxide and hydroxide	231	428	United Kingdom 165; Japan 60; West Germany 5.
Cobalt oxide and hydroxide	80	62	Belgium-Luxembourg 55; United Kingdom 7.
Copper:			
Copper sulphate	32	45	All from United Kingdom.
Metal including alloys, all forms	14,981	16,028	Japan 5,742; Australia 2,511; United Kingdom 1,439.
Gold metal, unworked or partly worked thousand troy ounces	2,372	1,749	United Kingdom 969; Australia 627; Netherlands 139.
Iron and steel:			
Metal:			
Scrap thousand tons	58	95	United Kingdom 42; West Germany 21; Australia 11.
Pig iron, ferroalloys, and similar material do	2	8	North Korea 5; People's Republic of China 3.
Steel, primary forms do	25	24	Australia 19; North Korea 3.
Semimanufactures:			
Bars, rods, angles, shapes, sections do	163	218	Japan 90; Taiwan 61; People's Republic of China 32.
Universals, plates, and sheets do	160	185	Japan 75; United Kingdom 58; Australia 18.
Other do	64	75	Japan 42; United Kingdom 11; Taiwan 7.
Lead metal including alloys, all forms	1,128	1,265	South Vietnam 492; United Kingdom 301; North Korea 100.
Magnesium, metals including alloys, all forms	5	4	Canada 2; Taiwan 2.
Manganese:			
Ore and concentrate	134	99	All from Thailand.
Oxides	4,392	3,563	Japan 3,038; People's Republic of China 167; Thailand 160.
Mercury 76-pound flasks	425	455	United Kingdom 312; Spain 55; People's Republic of China 40.
Nickel metal including alloys, all forms	182	512	Japan 212; Canada 59; United Kingdom 56; Netherlands 51.
Platinum-group metals including alloys, all forms thousand troy ounces	65	74	West Germany 45; United Kingdom 12; Australia 8.
Rare-earth oxides	4	3	United States 3.
Silver metal including alloys thousand troy ounces	347	171	Philippines 112; United Kingdom 23; United States 23.
Tin metal including alloys, all forms long tons	265	305	Malaya 100; Indonesia 68; United Kingdom 58.
Titanium:			
Ore and concentrate	141	122	All from Australia.
Oxides	3,766	3,710	Australia 1,175; United Kingdom 1,002; Japan 847.
Tungsten metal including alloys, all forms	1	2	Mainly from United States.
Zinc:			
Oxides	1,036	934	France 420; Australia 264; West Germany 168.
Metals including alloys, all forms	9,973	9,771	Australia 3,955; Canada 3,033; Japan 1,616.
Other:			
Ashes and residue containing nonferrous metals	409	370	All from United Kingdom.
Oxides, hydroxides and peroxides of metals, n.e.s	34	10	Japan 5; United Kingdom 2; United States 2.
Metals including alloys, all forms:			
Metalloids	17	80	Republic of South Africa 51; United Kingdom 17; United States 6.
Base metals, including alloys, all forms n.e.s	35	61	United States 53; Japan 5.

See footnotes at end of table.

Table 6.—Hong Kong: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969 [1]	1970	Principal sources, 1970
NONMETALS			
Abrasives:			
Natural n.e.s	542	634	United States 272; Japan 260; United Kingdom 42.
Grinding and polishing wheels and stones	528	586	People's Republic of China 168; United Kingdom 138; Japan 133.
Asbestos	304	122	Canada 109; Japan 8.
Barite and witherite	140	185	People's Republic of China 128; West Germany 35.
Boric oxide and acid	224	209	United States 188; People's Republic of China 18.
Cement thousand tons	417	487	People's Republic of China 211; Taiwan 145; Japan 116.
Chalk	20	11	Switzerland 10; West Germany 1.
Clays and products (including all refractory bricks):			
Crude n.e.s	8,276	7,037	United States 4,304; People's Republic of China 1,461; Japan 761.
Products [2]	23,084	28,216	Japan 18,584; People's Republic of China 8,347; Spain 2,420.
Cryolite and chiolite	37	31	All from Denmark.
Diamond, gem, not set or strung thousand carats	654	687	Belgium 185; Israel 184; India 118.
Diatomite and other infusorial earths	252	265	Japan 145; United States 120.
Feldspar and flourspar	509	383	Thailand 200; People's Republic of China 183.
Fertilizer materials:			
Crude	486	495	People's Republic of China 354; Taiwan 63; Canada 56.
Manufactured:			
Nitrogenous	1,170	2,321	Japan 2,291.
Potassic	35	9	All from West Germany.
Other including mixed	6,140	5,755	West Germany 4,947; Belgium 293; Japan 185.
Ammonia	752	417	Japan 327; United Kingdom 70; Taiwan 10.
Graphite, natural	359	302	People's Republic of China 254; United Kingdom 27; Japan 16.
Gypsum and plasters	18,794	5,039	Philippines 2,679; People's Republic of China 762; United Kingdom 723.
Lime	38,725	41,832	People's Republic of China 17,218; North Vietnam 11,607; Japan 6,027.
Magnesite	93	131	Austria 80; People's Republic of China 51.
Mica, all forms	35	42	India 29; West Germany 4; Japan 4.
Pigments, mineral including processed iron oxides	681	635	West Germany 402; United Kingdom 129; People's Republic of China 62.
Salt and brine	34,869	36,791	People's Republic of China 28,247; Thailand 4,446.
Sodium and potassium compounds, n.e.s	16,440	20,254	People's Republic of China 10,157; Japan 4,117; Taiwan 2,840.
Stone, sand and gravel:			
Dimension stone	3,893	5,539	People's Republic of China 3,033; Italy 2,165; Pakistan 154.
Dolomite	--	51	All from Japan.
Gravel and crushed rock	1,483	2,386	People's Republic of China 2,155; France 130; Italy 71.
Limestone (except dimension) thousand tons	347	263	Japan 263.
Quartz and quartzite	2,195	1,533	People's Republic of China 1,492; Macau 41.
Sand, excluding metal bearing	1,728	1,976	People's Republic of China 1,794; Japan 146.
Sulfur:			
Elemental all forms	2,038	2,305	West Germany 743; Japan 530; Poland 500.
Sulfuric acid	535	563	Japan 278; Taiwan 184; United Kingdom 86.
Talc, steatite, soapstone, and pyrophyllite	2,771	3,169	People's Republic of China 2,752; Italy 165; India 80.
Other nonmetals, n.e.s.:			
Crude	1,594	1,660	People's Republic of China 1,474; United States 81; Mozambique 72.
Slag dross, and similar waste, not metal bearing	111,886	174,104	Taiwan 118,112; Republic of Korea 35,917; Japan 19,354.
Oxide and hydroxides of magnesium, strontium, and barium	4	31	West Germany 21; United Kingdom 5; People's Republic of China 3.
Bromine, iodine and fluorine	1	(3)	NA.
Building materials of asphalt, asbestos and fiber cement and unfired nonmetals	13,418	14,890	United Kingdom 7,134; People's Republic of China 2,614; Malaya 2,118.

See footnotes at end of table.

Table 6.—Hong Kong: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969 [1]	1970	Principal sources, 1970
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	179	78	Trinidad and Tobago 51; United States 27.
Carbon black and gas carbon	905	727	Japan 593; United States 109; West Germany 15.
Coal, coke, and peat including briquets	52,806	31,719	People's Republic of China 20,778; North Vietnam 5,054; Japan 4,562.
Petroleum refinery products:			
Gasoline including natural thousand 42-gallon barrels	949	843	Singapore 348; Bahrain 187; Iran 158.
Kerosine and jet fuel do	4,457	4,301	Singapore 1,544; Iran 1,387; Saudi Arabia 669.
Distillate fuel oil do	4,319	4,707	Philippines 1,285; Saudi Arabia 1,193; Singapore 1,033.
Residual fuel oil do	14,356	16,870	Saudi Arabia 6,990; Singapore 5,345; Iran 1,643.
Lubricants do	308	329	Japan 123; United States 88; Netherlands Antilles 51.
Mineral jelly and wax do	90	89	Indonesia 50; Singapore 20; People's Republic of China 11.
Other:			
Pitch do	1	1	Mainly from United Kingdom.
Bitumen and other mixtures do	78	19	Japan 18.
Bituminous mixtures, n.e.s. do	2	3	United Kingdom 2; New Zealand 1.
Liquefied petroleum gas do	239	292	Singapore 75; Japan 65; Taiwan 56.
Mineral tar and other coal–, petroleum–, or gas–derived crude chemicals	211	479	United Kingdom 446; Japan 33.

NA Not available.

[1] Virtually all figures in this column revised owing to use of conversion factor for short hundred weights to metric tons in previous editions; revised data converted using factor for long hundred weights to metric tons.

[2] Excludes bricks and other clay products valued at 6,637,766 HK$ for 1969 and 9,434,058 HK$ for 1970.

[3] Less than ½ unit.

COMMODITY REVIEW

Metals.—*Iron Ore.*—Hong Kong's only iron mine, Ma On Shan, continued to receive technical assistance from the Japanese and exported exclusively to Japan. Production declined slightly in 1971 to 162,739 tons. Mining, which started on the surface, has gone completely underground. In late 1971 mining operations had progressed to the 240-meter level. Recent development drilling delineated new minable reserves beneath known ore bodies. Thus, the life of the mine was expected to be extended. There is a beneficiation plant at the mine.

Iron and Steel.—Hong Kong has a small steel industry based mainly on domestic and imported scrap. About 2,000 persons were employed in roughly 24 small iron and steel plants. The total capacity of these plants was approximately 350,000 metric tons per year, with only two having an annual capacity of more than 30,000 tons.

Significant gains were made by the steel rolling industry of Hong Kong during 1968–70, but output leveled off in 1971, as shown in metric tons: 1968, 171,244; 1969, 197,330; 1970 (preliminary), 260,360, 1971 (estimate), 260,000.

Hong Kong's production of rolled steel consisted of round, flat, channel, angle, square bar, and window section steel, including 80 percent round steel bars. Because of competition from imports, the rising cost of raw materials and labor, the closing of one mill of 12,000 tons per year, and U.S. restrictions on imports of stainless steel, steel production in the Colony was not expected to increase in 1971.

Nonferrous Metals.—Hong Kong had two nonferrous metal mills of some size in 1971, both fairly new and both joint ventures. A brass mill, mainly owned by the Japanese firms Kobe Steel Co. and Nissho-Iwai, Ltd., has a monthly capacity of 300 tons of plates and sheets. The aluminum mill, size unknown, is a joint venture with Australia's Comalco, Ltd.

Mineral Fuels.—*Petroleum.*—Approval was given for Shell Oil Co. to survey several sites in the Colony, including the northern part of Lamma Island, for a possible $250 million tanker terminal, storage, and refinery complex. Applications from two other companies were still under consideration. There has been no news about a plan by the Peninsula Petroleum Co., Ltd., to build a 10,000-barrel-per-day refinery and storage facility.

KHMER REPUBLIC (FORMERLY CAMBODIA) [12]

War-time conditions and the general economic situation in Khmer Republic in 1971 continued to hinder mineral development and industrial progress. Mineral production was apparently limited to small quantities of precious and semiprecious stones, salt, and simple construction materials. Severe war damage closed down the country's only cement plant, phosphate plant, and oil refinery in 1971, and output, if any, from the plants was not officially reported.

Plans were either postponed or abandoned for mineral industry projects in the last year of Khmer Republic's second 5-year development plan, owing to limited raw materials and transportation, shortage of manpower, lack of funding, and internal insecurity brought about by the war. Projects postponed in 1971 were a second cement plant and a fertilizer plant. The proposed plan to establish a small steel industry based on development of the country's iron ore resources was abandoned.

In September 1971 major damage, estimated at $1.5 million, was inflicted on equipment being used to build the United Nations-sponsored Prek Thnot hydroelectric plant. The project, which had been at a standstill since 1969, included the construction of a dam and an 18,000 kilowatt powerplant.

COMMODITY REVIEW

Nonmetals.—Severe war damage to the state owned and managed National Cement Co. plant at Chakrey Ting near Kampot suspended cement production in 1971. Repair work was reported in progress at the plant and limited production was expected to be resumed before yearend.[13]

Mineral Fuels.—Khmer Republic controlled Société Khumère de Raffinage oil refinery at Kompong Som was severely damaged in March 1971, and production was suspended. No plans were made during the year to repair the damage and resume production. In addition, several oil storage tanks in Phnom Penh were also damaged by enemy raids.

The French company, ELF-ERAP(ELF) Cambodge, a subsidiary of Enterprise de Recherches et d'Activities Pétrolières (ERAP), which was granted oil exploration rights to Khmer Republic's Continental Shelf area in 1970, was to have conducted a detailed seismic survey in the first quarter of 1971. Results of the survey, however, were not known at yearend.

LAOS [14]

Tin mining was the only significant mineral activity in Laos in 1971.

The country's industrial development was at a very low level and the transportation system was paralyzed as a result of North Vietnamese military action. In addition, the national budget was again largely devoted to defense, and political instability prevented further progress in the third year of the country's 5-year development plan.

The principal Laotian mineral imports in 1971 were cement, petroleum products, and iron and steel semimanufactures. Laos continued to run a large trade deficit with imports exceeding exports by 20 to 1.

Construction of the Nam Ngum dam, north of Vientiane, was completed in late 1971 as part of the Nam Ngum hydroelectric project—the largest construction venture in the country's history. The project was undertaken to provide a year-round source of water and cheap electricity needed to power irrigation pumps; to provide light and heat for small towns and villages; and, hopefully, to stimulate the future growth of light industries in the city of Vientiane. Initial power output will be 30,000 to 35,000 kilowatts, but plans have been made to increase this to 135,000 kilowatts. An undetermined amount of electric power will go to Thailand over a

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[12] Prepared by Arthur C. Meisinger, industry economist, Division of Nonmetallic Minerals.

[13] U.S. Embassy, Phnom Phen, Cambodia—Industrial Sector Production and Industrial Production, 1969–1971. State Department Airgram A-68, May 7, 1971, p. 4.

[14] Prepared by Arthur C. Meisinger, industry economist, Division of Nonmetallic Minerals.

5-year period for repayment of borrowed electric power and imported cement used in construction of the Nam Ngum dam.

COMMODITY REVIEW

Metals.—Gold ceased to be a source of revenue for Laos in 1971. In the past several years, the import tax on gold accounted for as much as 40 percent of the Laotian Government-collected taxes. In 1971, however, the fluctuating price of gold, the lower import taxes of Singapore, and the tightening of customs inspection in Saigon all combined to squeeze Laos out of the market.

Mining and processing of tin continued to show improvement at the French-managed Phon Tiou mine and the much smaller Laotian-run Nong Sun mine in 1971. Production of tin concentrates in Laos was increased by 11 percent over that of 1970, and amounted to 1,548 tons. Most of the tin concentrates were exported to Malaysia for smelting. Recoverable tin content of the concentrates has been 50 percent or less in recent years.

Nonmetals.—The quantity of rock salt produced (400 tons) from brine operations near Vientiane in 1971 was substantially lower than in 1970.

MONGOLIA [15]

Continued progress apparently was made by Mongolia's small mineral industry in 1971, as various sectors and important facilities reportedly overfulfilled their goals. Estimated gains over 1970 amounted to approximately 20 percent for all mining, 15 percent for the fuels, 4 percent for the construction materials industries, and 8 percent for electric power generation.

Presently, coal production accounts for an estimated 60 percent of Mongolia's mineral output by value. During the year, coal output increased about 4 percent over that of 1970 and apparently met the 1971 target. Most production came from the large Sharyn Gol surface coal mine, which has an annual capacity of about 1.1 million tons. Nalaikha, the country's only other important coal mine, which has failed to achieve targets in recent years, reportedly surpassed its goal for 1971. A modernization program being carried out by Soviet technicians is expected to raise production of Nalaikha to 600,000 tons of coal per year.

The important construction materials sector reportedly met its output goal of an 8.5-percent increase. Specific information was not available on cement; however, plans call for doubling production by 1975. Work was begun on a brick plant which will have an annual capacity of 3 to 5 million standard bricks.

All of the fluorspar and tungsten, Mongolia's only mineral export items of consequence, are shipped to the Soviet Union. Based on U.S.S.R. import statistics, Mongolia's fluorspar production apparently increased slightly over 1970, reaching at least 80,000 tons.

Over $11 million has been budgeted for geological prospecting during 1972. Drilling work has been planned for exploring gold, tin, tungsten, and coal prospects. Particular emphasis will be directed toward the location of good-quality sand and gravel in Dzabhan Province for a concrete plant, materials for brickmaking in Hentey Province, and coal deposits in the eastern region to satisfy the needs of that part of Mongolia.

No official Mongolian trade data are available. However, because at least 85 percent of total Mongolian trade is with the U.S.S.R., officially recorded Soviet trade statistics are believed to be highly indicative of total Mongolian mineral commodity trade. Soviet imports of Mongolian fluorspar were given as 75,800 tons in 1969 and 76,600 tons in 1970. Small quantities of ferrous scrap and unspecified ores and concentrates including tungsten are also imported. Iron and steel exports from the U.S.S.R. to Mongolia were 17,980 tons in 1969 and 19,460 tons in 1970. Small quantities of Soviet nonferrous metals, refractories, coal, and coke also were imported.

Cement imports, from the Soviet Union, totaling 20,000 tons in 1969 and 19,000 tons in 1970, indicate that the recently expanded Darkhan cement plant was still unable to meet domestic requirements. The principal Soviet contribution to the Mongolian mineral economy was still petroleum. In fact, the greater part of Mongolia's oil demand has been met by Soviet refined petroleum. The U.S.S.R. also supplies enough crude oil to keep the small Dzuun Bayan refinery operating at full capacity. Exports of refined petroleum and crude oil from the U.S.S.R. to Mongolia totaled about 2.10 million barrels in 1969 and 2.06 million barrels in 1970.

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[15] Prepared by Donald C. Wininger, physical scientist, Division of Nonmetallic Minerals.

NEPAL [16]

The Kingdom of Nepal, with its small geographical area and limited population, has no formalized, continuously operating minerals industry. Any small production from indigenous mineral deposits that occurred was available to meet any local demand for items such as iron, copper, and construction materials.

The West German consulting firm, Grundstoff Beratung, will provide the Nepalese Bureau of Mines with technical assistance for the evaluation of a large magnesite deposit located at Kharidhunga, Sindupalchok district. The Bureau claims that the deposit has 16 million tons of proven high-grade ore reserves and the possibility of an additional 30 million tons of inferred reserves. Nepal must attract the necessary investment capital required to develop this deposit, which was discovered more than 6 years ago.

In the later part of the year the Governments of the Kingdom of Nepal and the People's Republic of China exchanged letters that provided for two teams of geologists to make mineral surveys in Nepal. One team was expected to conduct a survey of phosphate rock in the Dharan and Baraha areas, a feasibility study of the Pulchoki iron deposits of the Kathmandu Valley, and a survey of existing iron mines at Labdhi Khola, Ramechhap, and Jeruwang in the Chituan area. The other survey team was expected to search for petroleum in the Muktinath area and the Longu Valley.

Nepal's mineral industry will probably be slow to develop and will be dependent on the development of both domestic and export markets for its mineral resources. The continued development of the country's road system and clear commercial access to a seaport would be a significant contribution to any developing minerals industry.

SINGAPORE [17]

Singapore achieved a 14-percent rate of economic growth, with the gross national product (GNP) in 1971 estimated at $2.33 billion (or 6.99 billion Singapore dollars). Considering the world monetary crisis and trade slowdown, Singapore's performance was most impressive. Per capita income, rising 12 percent, passed the $1,000 mark for the first time. Capital formation quadrupled in the last 5 years, reaching $628 million in 1971. The trend is expected to continue, with manufacturing, including oil and related ventures, and shipping and services leading the way. Favorable government policies towards foreign investments and efforts to upgrade and bring in technical personnel have been important in stimulating the economy.

Manufacturing, which encompasses fields like petroleum refining, metal fabrication, cement, and chemicals, gained ground as the leading component of the GNP. Manufacturing output, measured in terms of value added, increased to $500 million, one-fifth of the 1971 GNP and five times what is was a decade ago. Establishment of export-oriented industries and production of more sophisticated products in the electronics and machinery areas, for example, were being pushed to help broaden the manufacturing base.

Singapore's shipbuilding and ship repair industries registered a turnover of possibly $100 million, one-third greater than in 1970. Expansion of facilities to build and service oil rigs and oil exploration support vessels and constructing drydocks to handle larger size supertankers were important aspects of this business.

Petroleum continued to play a vital role in Singapore's industrial progress. Refining facilities have been steadily expanded, with overall capacity rising two-thirds as compared with 1970. At yearend 1971, three of the four existing refineries were undergoing expansion and a fifth was being built. Construction underway and plans already formulated probably will bring Singapore's refining capacity to more than 1 million barrels per day by the mid-1970's. As a city, Singapore already owns the largest petroleum refining complex in Southeast Asia and, if expansion proceeds as programed, the country may one day have the world's third leading complex. During 1971 Singapore's position as regional headquarters for petroleum and other mineral exploration activities was further strengthened.

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[16] Prepared by Benjamin Petkof, physical scientist, Division of Nonmetallic Minerals.

[17] Prepared by K. P. Wang, supervisory physical scientist, Division of Nonmetallic Minerals.

PRODUCTION

Aside from petroleum and steel products, the only significant mineral activities were the quarrying of granite and the manufacture of cement. Singapore produced 2,176,900 cubic yards of crushed granite and 613,150 tons of cement during 1971. The construction boom has accentuated the cement shortage, and imports were probably of the same order as output, with Japan supplying about 360,000 tons and Malaysia and Taiwan, sizeable quantities also. Production of refined petroleum rose by more than 60 percent, as shown in table 1 covering recent years. In view of the new oil refining facilities completed, further sharp increases in output can be anticipated. In 1971 crude oil processed at Singapore's refineries amounted to approximately 115 million barrels.

TRADE

Singapore's total foreign trade increased to $4.78 billion in 1971, as compared with $4.10 billion in 1970. Exports were valued at $1.79 billion and imports at $2.89 billion. The trade deficit was more than offset by income from services such as tourism, banking, insurance, shipping, and capital inflow from abroad to register a net balance of payments surplus of $282 million. These figures do not include trade with Indonesia which may account for part of the apparent deficit. Entrepôt trade, the traditional lifeblood of Singapore's economy, rose by 3 percent to represent 11 percent of the 1971 national income.

As in past years, trade in crude oil and petroleum products was most significant. Crude oil imports in 1971 came to about 115 million barrels valued at just above $250 million, roughly 55 percent from Kuwait, 18 percent from Saudi Arabia, 15 percent from Iran, and 11 percent from Sarawak. Almost all of the crude oil (and partly refined petroleum) was refined locally. Singapore also imported approximately 45 million barrels of refined petroleum and exported over 100 million barrels, nearly one-half in both cases in the form of fuel oil. During 1971 Singapore supplied about 20 million barrels of fuel for international bunkers.

Although firm figures are not available, the country's 1971 imports of iron and steel products were valued at more than $100 million, and imports of cement at possibly $15 to $20 million.

COMMODITY REVIEW

Metals.—*Iron and Steel.*—Singapore's consumption of steel products has risen sharply in recent years, having attained the approximate level of 1 million tons per year. Only a small part of the demand is met by indigenous production, which stood at 123,578 metric tons of steel ingots (derived from scrap) and 161,000 tons of rolled products in 1971. Japan has been by far the most important supplier of steel products to Singapore, furnishing 211,000 tons in 1968, 337,000 tons in 1969, 449,000 tons in 1970, and 658,000 tons in 1971. About two-thirds of the steel imports from Japan consisted of shapes, plates, and pipes and tubing.

Singapore's principal steel producer is the privately owned National Iron & Steel Mills, Ltd., with plant at Jurong which started operations in 1964. The plant is equipped with two 25-ton electric arc furnaces (with plans to build a third one), three merchant bar mills (100,000 tons, 36,000 tons, and 7,500 tons per year), and a wire rod mill. Initially capitalized at $8 million, National has already recovered all its investments, earning more than $2 million profits annually in recent years. Production has been fairly stable, averaging just over 110,000 tons of steel products per year.

The Malayan Iron & Steel Mills, Ltd., has been reported as the second producer. Two other small steel fabricators were to be built, each at a cost of about $7 million. The Singapore Steel Supply Centre Ltd. will be a joint government-private enterprise, and Leong Huat Industries Ltd. will be privately owned. Initial capacity of the Leong Huat plant will be approximately 1,000 tons of steel sections, 3,000 tons of mild steel plates, and 3,000 tons of steel strips per month.

In view of the rapid growth in steel demand, the Singapore Economic Development Board has been trying to interest foreign capital in helping to build an integrated steel plant in Singapore. A proposal was submitted in mid-1970 by the Australian firm Broken Hill Pty. Co. Ltd. to build a 400,000- to 500,000-ton plant under the joint auspices of National Iron & Steel Co., the Development Bank of Singapore, the Government of Singapore, and Broken Hill. The Government has not approved this project, claiming that such a plant would not be adequate for meeting the country's requirements. Instead, it has requested the Japanese firm Nippon Steel Corp. to make an appraisal for a 5-million-ton plant. Since much of the output would have to be exported, Nippon Steel did not immediately endorse this latter plant. As of late 1971, a project to build some kind of a large steel plant in Singapore was still very much alive.

In connection with the steel business, it was reported in late 1971[18] that India Hard Metals Ltd. was making plans to build a $3.4 million ferrosilicon plant in Jurong, Singapore, with a view to exporting much of the output to neighboring countries.

Nonmetals.—*Cement.*—The building boom in Singapore has developed a shortage situation in cement. Singapore Cement Manufacturing Co. Ltd., Asian Cement (Malaysia), Ltd., and Pan Malaysia Cement Works Ltd., with a combined capacity of about 80,000 to 85,000 tons per month, are the only three producers. Production was reported at 725,516 metric tons for 1970 and 613,150 tons for 1971. Singapore Cement was planning to acquire some land in the port area for an expansion project while Asian Cement was in the final stages of doubling its production to 40,000 tons per month. Meanwhile, sizable tonnage of cement had to be imported in 1971 at about $21 per ton.

Mineral Fuels.—*Petroleum.*—Singapore's petroleum refining facilities have been expanded at a very rapid pace during the last 5 years. In 1971 alone, capacity was raised by about 250,000 barrels per day, to approximately 625,000 barrels at yearend. This latter capacity roughly corresponds to the total for all of the People's Republic of China. Growth is expected to continue unabated in Singapore. Refineries in the process of being built should bring the country's capacity to well over 800,000 barrels by the end of 1974.

Although lacking in crude, many factors favor Singapore as the site for building refineries. Oil demand has grown at a rate far exceeding expectations. The tanker traffic has increased steadily, particularly from the Middle East to Japan; this in turn means more need for bunker fuel, the leading oil product made in Singapore's refineries. Sharp increases in bunker fuel prices have also made refinining more lucrative. Southeast Asia is also consuming increasing quantities of petroleum. Whereas oil demand in Japan is soaring, building refineries there has become more difficult, because of environmental considerations; this gives Singapore an opportunity to share more in the Japanese market.

Petroleum refining remained Singapore's largest recipient of foreign investment, and accounted for a third of the total output value of manufactured goods. In early 1971, foreign investments in oil totaled about $250 million, roughly one-half by U.S.-affiliated companies. By 1975, possibly another $200 million will have been invested. Four refining companies were operating in Singapore during 1971, and a fifth was scheduled to start production by 1973.

Shell Eastern Petroleum, Ltd., owns the largest oil refining complex in Asia excluding the Middle East. Three refineries with a combined capacity of 250,000 barrels per day are already operating on Pulau Bukum and a fourth refinery of 100,000 barrels will be completed by 1974. Shell's eventual 350,000 barrels in Singapore compares with 500,000 barrels of another Royal Dutch Shell-owned oil refining complex at Pernis, the Netherlands—the largest in the world at yearend 1971. Facilities at the Pulau Bukum complex include two hydrodesulfurization plants, a 50,000-ton liquefied petroleum gas (LPG) plant, a 120,000-ton asphalt plant, a 60,000-ton hydrocarbon solvents plant, and a 25-million-gallon lubricants plant.

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[18] Asian Manufacturing (Hong Kong). October 1971, p. 3.

Table 7.—Singapore: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
METALS			
Aluminum:			
Bauxite and concentrate	301	100	All to Taiwan.
Oxide and hydroxide	2,315	1,965	All to Malaysia.
Metal including alloys, all forms	867	921	Malaysia 487; South Vietnam 377; Brunei 38.
Chromium oxide and hydroxide	7	9	Malaysia 7.
Copper:			
Ore and concentrate	1,016	1,118	All to Japan.
Metal including alloys, all forms	562	485	Malaysia 452.
Iron and steel:			
Ore and concentrate	99,263	61,712	All to Japan.
Metal including alloys:			
Scrap	1,123	4,909	France and Monaco 2,818; Japan 1,457; Taiwan 300.
Pig iron and ferroalloys	260	218	All to Malaysia.
Sponge iron, powder and shot	6	16	Do.
Steel, primary forms	1,945	1,639	Malaysia 1,516; Hong Kong 43.
Semimanufactures:			
Bars, rods, angles, shapes, sections	12,811	18,229	Malaysia 11,426; Brunei 3,324; Khmer Republic 2,217.
Universals, plates, and sheets	31,255	26,384	Malaysia 22,454; Brunei 1,166; Thailand 983.
Hoop and strip	1,070	1,042	Malaysia 940; South Vietnam 36; Thailand 28.
Rails and accessories	962	655	Philippines 508; Malaysia 121.
Wire	7,748	4,145	Malaysia 3,563; Brunei 288; Hong Kong 188.
Tubes, pipes and fittings	19,096	14,964	Malaysia 5,591; Brunei 4,788; Pakistan 816.
Castings and forgings, rough	232	136	Malaysia 124; Brunei 8.
Total	73,174	65,555	
Lead:			
Oxides	6	2	Mainly to Malaysia.
Metals including alloys, all forms	831	791	Malaysia 227; Denmark 155; Italy and San Marino 115.
Manganese:			
Ore and concentrate	2,452	1,021	Malaysia 1,001; Netherlands 20.
Oxides	42	113	Netherlands 50; Malaysia 48.
Mercury ... 76-pound flasks	13	17	Hong Kong 11; Malaysia 6.
Nickel metal including alloys, all forms	18	13	Malaysia 13.
Platinum metal including alloys ... troy ounces	277	195	Hong Kong 193; Thailand 2.
Silver metal including alloys ... thousand troy ounces	1,486	452	Mainly to United Kingdom.
Tin:			
Ore and concentrate ... long tons	1,419	2,468	Malaysia 1,055; Spain 806; Netherlands 207.
Metal, including alloys, all forms ... do	223	285	Malaysia 96; Bulgaria 59; Hong Kong 58.
Titanium oxides	323	310	All to Malaysia.
Zinc:			
Oxide	208	95	Malaysia 95.
Metal, including alloys, all forms	2,246	1,300	Malaysia 1,217; South Vietnam 40; Australia 24.
Other:			
Ore and concentrate	17	236	Belgium-Luxembourg 71; United Kingdom 67; Netherlands 31; Japan 30.
Ash and residue containing nonferrous metals	1,364	1,884	Malaysia 1,531; Taiwan 1,464; Japan 78.
Oxides, hydroxides and peroxides of metals, n.e.s	33	46	Malaysia 33; Thailand 13.
Metals, including alloys, all forms:			
Metalloids	4	9	Malaysia 6; Thailand 3.
Alkali, alkaline earth and rare-earth metals	1	1	All to Malaysia.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	r 23	11	Malaysia 11.
Grinding and polishing wheels and stones	49	36	Malaysia 31.
Asbestos	83	184	South Vietnam 91; Malaysia 84.
Cement and clinker	10,148	15,868	Malaysia 8,863; Christmas Island 2,008; Brunei 1,771.
Clays and products (including all refractory brick):			
Crude clays, n.e.s	1,552	2,020	Malaysia 1,375; Mozambique 268; Australia 186.
Products	r 3,742	3,744	Malaysia 2,314; Brunei 543; Netherlands 189.

See footnotes at end of table.

Table 7.—Singapore: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal destinations, 1970
NONMETALS—Continued			
Diamond, gem not set or strung value, thousands	$1,711	$2,180	Malaysia $1,628; Hong Kong $456; Kuwait $58.
Diatomite and other infusorial earths	(1)	(1)	NA.
Feldspar and fluorspar	2,836	1,798	All to Malaysia.
Fertilizer materials:			
Crude:			
Nitrogenous	12	10	Malaysia 9.
Phosphatic	11,803	9,051	Malaysia 8,972; Thailand 61.
Potassic	30	--	
Other	24,234	16,356	Malaysia 16,336; Brunei 20.
Manufactured:			
Nitrogenous	18,201	12,627	Malaysia 12,440; Brunei 153.
Phosphatic	24,775	2,432	Malaysia 2,405; Kuwait 15.
Potassic	46,843	63,961	Malaysia 61,451; South Vietnam 2,499.
Other, including mixed	24,282	21,155	Malaysia 17,828; Thailand 2,999.
Graphite, natural	20	7	All to Malaysia.
Gypsum and plasters	1,414	311	Malaysia 167; Thailand 85; Taiwan 55.
Lime	1,124	850	Malaysia 689; Brunei 150.
Magnesite	2,250	1,680	Malaysia 1,664; Brunei 16.
Pigments, mineral	37	8	Malaysia 8.
Precious and semiprecious stones, except diamond value, thousands	$753	$1,098	Hong Kong $852; Japan $99; Switzerland $48.
Salt	9,517	6,596	Malaysia 5,951; Brunei 329.
Sodium and potassium compounds, n.e.s	1,256	1,848	Malaysia 1,685; Khmer Republic 91; Thailand 47.
Stone, sand and gravel:			
Dimension stone	234	131	Malaysia 118; Brunei 13.
Dolomite, chiefly refractory grade	4	7	All to Malaysia.
Gravel and crushed rock	31,165	25,176	Brunei 23,879; Malaysia 1,297.
Limestone (except dimension)	172	96	Malaysia 92; Thailand 4.
Quartz and quartzite	22	17	All to Malaysia.
Sand excluding metal bearing	235	875	Malaysia 448; Christmas Island 405; Brunei 12.
Sulfur:			
Elemental, all forms	7,422	5,872	Malaysia 5,855.
Sulfuric acid	1,030	402	Ceylon 241; Malaysia 111; South Vietnam 20.
Talc, steatite, soapstone, and pyrophyllite	1,205	1,020	Malaysia 1,002; Thailand 18.
Other nonmetals, n.e.s.:			
Crude	7,687	12,809	Malaysia 7,935; Brunei 4,314; Australia 372.
Slag, dross and similar waste, not metal bearing	23	5	Malaysia 5.
Building materials of asphalt, asbestos and fiber cement and unfired nonmetals, n.e.s	17,646	16,171	Malaysia 5,620; South Vietnam 4,199; Brunei 2,398; Pakistan 1,548.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	16	56	All to Malaysia.
Carbon black	679	327	Malaysia 320; Thailand 5.
Coal and coke, including briquets	1,575	766	Malaysia 717; Khmer Republic 21; Thailand 20.
Petroleum:			
Crude and partly refined 42-gallon barrels	926	50,347	All to Japan.
Refinery products:[2]			
Gasoline:			
Aviation thousand 42-gallon barrels	[r] 3,721	2,073	Malaysia 1,117; Thailand 640; Papua 151.
Motor do	9,928	11,232	South Vietnam 3,833; Japan 3,496; Malaysia 1,096.
Kerosine and jet do	[r] 22,932	19,290	South Vietnam 10,622; Thailand 2,607; Japan 2,123.
Distillate fuel oil do	17,322	17,470	South Vietnam 6,869; Malaysia 3,207; Thailand 2,545.
Residual fuel oil do	31,500	37,525	Japan 24,885; Hong Kong 5,175; South Vietnam 2,911.
Lubricants do	1,010	1,018	Thailand 318; Malaysia 260; South Vietnam 187.
Mineral jelly and wax do	220	124	Other countries of Central Africa 22; Thailand 21; Mozambique 18.
Other do	[r] 905	1,064	South Vietnam 465; Malaysia 219; Australia 111.
Total do	[r] 87,538	89,796	
Mineral tar and other coal–, petroleum–, or gas–derived crude chemicals thousand tons	158	143	Australia 123; New Zealand 11; Japan 8.

[r] Revised. NA Not available.

[1] Less than ½ unit.

[2] In addition to the products listed, liquefied petroleum gas valued at $1,005,000 in 1969 and $1,317,000 in 1970 was also exported.

Table 8.—Singapore: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS			
Aluminum:			
Bauxite and concentrate	581	716	People's Republic of China 599; United States 117.
Oxide and hydroxide	7,234	7,965	Japan 5,338; People's Republic of China 2,609; Greece 6.
Metal including alloys, all forms	7,466	8,347	Japan 2,951; United States 1,367; Hong Kong 872.
Chromium oxide and hydroxide	8	50	West Germany 16; Japan 10; United Kingdom 7.
Copper:			
Ore and concentrate	1,016	1,016	All from Malaysia.
Metal including alloys, all forms	2,897	4,679	Japan 1,562; Australia 1,375; United Kingdom 387.
Iron and steel:			
Ore and concentrates	71	37,926	All from West Malaysia.
Metal:			
Scrap	31,608	33,259	South Vietnam 19,378; Malaysia 10,824; United States 1,900.
Pig iron, ferroalloys and similar materials	6,652	8,533	U.S.S.R. 4,299; Australia 1,929; Switzerland 549.
Sponge iron, powder and shot	248	383	United Kingdom 136; Japan 106; Italy and San Marino 66.
Ingots and other primary forms	32,562	35,584	North Korea 17,715; Japan 12,821; Republic of Korea 2,591.
Semimanufactures:			
Bars, rods, angles, shapes, sections	98,173	147,231	Japan 85,784; Taiwan 15,128; United Kingdom 9,331.
Universals, plates and sheets	244,504	313,503	Japan 262,390; United Kingdom 22,079; United States 8,529.
Hoop and strip	20,490	23,430	Japan 19,995; Australia 3,081; Belgium-Luxembourg 126.
Rails and accessories	5,408	11,866	Malaysia 4,457; Australia 4,032; France and Monaco 1,349.
Wire	16,818	16,502	Japan 13,349; People's Republic of China 1,033; Taiwan 471.
Tubes, pipes and fittings	48,832	78,227	Japan 62,790; United States 4,315; India 2,474.
Castings and forgings	476	797	Japan 200; Italy and San Marino 168; People's Republic of China 167.
Total	434,701	591,556	
Lead:			
Ore and concentrate	10	8	Morocco 5; France and Monaco 3.
Oxide and hydroxide	6	457	Australia 228; United Kingdom 157; Japan 50.
Metal including alloys, all forms	1,435	1,563	Australia 709; Malaysia 555; United Kingdom 137.
Manganese:			
Ore and concentrate	3,758	5,596	Ghana 5,278; Australia 309; Malaysia 9.
Oxides	261	626	Japan 615; Hong Kong 5.
Mercury .... 76-pound flasks	16	115	United States 110; Australia 3; West Germany 2.
Nickel metal including alloys, all forms	40	70	Japan 25; Australia 24; United Kingdom 14.
Platinum-group metals and silver:			
Waste and sweepings .. troy ounces	16,007	NA	
Metals including alloys:			
Platinum group .... do	[r] 156	3,677	Japan 2,304; United Kingdom 698; Australia 643.
Silver .... do	[r] 159,362	711,643	Australia 647,648; United Kingdom 23,072; Malaysia 21,839.
Tin:			
Ore and concentrate ..... long tons	823	1,120	Malaysia 1,081; Thailand 39.
Oxides .... do	(1)	1	Mainly from United Kingdom.
Metal including alloys, all forms .... do	219	365	Malaysia 175; United Kingdom 110.
Titanium oxides	1,671	2,404	Japan 820; Australia 735; United Kingdom 431.
Zinc:			
Oxide and peroxide	648	942	Australia 511; West Germany 115; United Kingdom 81.
Metal including alloys, all forms	6,082	9,404	Canada 5,951; Australia 1,210; Japan 1,126.

See footnotes at end of table.

Table 8.—Singapore: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
METALS—Continued			
Other:			
Ore and concentrate	19	325	Malaysia 274; Australia 50.
Ash and residue containing nonferrous metals	79	157	United Kingdom 95; Australia 62.
Oxides, hydroxides and peroxides of metals n.e.s	138	116	Norway 32; U.S.S.R. 25; United Kingdom 24.
Metals including alloys, all forms	2,024	1,865	Austria 905; unspecified Central African countries 508; West Germany 362.
NONMETALS			
Abrasives, natural n.e.s.:			
Pumice, emery, natural corundum etc	34	71	Japan 16; United Kingdom 15; West Germany 15.
Dust and powder of precious and semiprecious stones value	$2,380	$574	All from United States.
Grinding and polishing wheels and stones	200	1,438	United Kingdom 1,038; Japan 110; Italy and San Marino 109.
Asbestos	1,165	3,150	Canada 1,884; unspecified Central African countries 852; United Kingdom 321.
Cement	656,215	760,431	Japan 347,779; Malaysia 253,021; Taiwan 104,409.
Clays and products (including refractory brick):			
Crude n.e.s	10,475	18,139	United States 10,742; United Kingdom 2,450; Japan 2,040.
Products:			
Refractory (including nonclay bricks)	6,419	8,394	Japan 2,351; People's Republic of China 1,724; United Kingdom 1,557.
Nonrefractory	20,483	23,678	Japan 10,018; People's Republic of China 5,003; Malaysia 2,785.
Diamond:			
Gem, not set or strung value, thousands	$580	$1,249	Malaysia $550; India $266; People's Republic of China $162.
Industrial do	$26	$165	All from Australia.
Diatomite and other infusorial earths	152	138	Japan 67; United States 67.
Feldspar and fluorspar	5,212	4,025	India 3,902; United Kingdom 108; Hong Kong 10.
Fertilizer materials:			
Crude:			
Nitrogenous	--	72	Mainly from Chile.
Phosphatic	10,980	14,034	Christmas Island 13,932; Japan 100.
Potassic	(1)	9	All to Malaysia.
Other	477	296	Malaysia 156; Thailand 124.
Manufactured:			
Nitrogenous	21,143	98,214	United States 60,148; Japan 27,506; West Germany 9,249.
Phosphatic	47,641	1,756	Netherlands 898; Portugal 539; Spain 199.
Potassic	57,299	79,843	Israel 45,122; Canada 27,570; United States 6,805.
Other including mixed	27,993	29,372	West Germany 11,950; Belgium-Luxembourg 9,206; Republic of Korea 5,426.
Graphite, natural	131	204	Japan 80; People's Republic of China 51; United Kingdom 47.
Gypsum and plasters	24,812	29,204	Australia 18,248; Japan 9,402; People's Republic of China 1,146.
Lime	7,746	8,396	Malaysia 6,667; United Kingdom 1,317; People's Republic of China 300.
Magnesite	94	215	Austria 200; Japan 12.
Mica, all forms	334	508	United States 484; United Kingdom 18.
Pigments, mineral	73	369	People's Republic of China 265; Japan 44; Spain 30.
Precious and semiprecious stones, except diamond value, thousands	$1,023	(1)	NA.
Salt and brine	93,503	42,204	Thailand 24,990; India 11,269; People's Republic of China 3,092.
Sodium and potassium compounds, n.e.s	1,967	5,561	West Germany 1,756; United Kingdom 1,302; United States 579.

See footnotes at end of table.

Table 8.—Singapore: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1969	1970	Principal sources, 1970
NONMETALS—Continued			
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	48,183	1,378	People's Republic of China 808; Malaysia 240; Italy and San Marino 140.
Worked	1,421	2,388	Italy and San Marino 1,100; People's Republic of China 662; Taiwan 281.
Dolomite, chiefly refractory grade	4,177	3,200	Malaysia 2,914; Austria 250; Taiwan 30.
Gravel and crushed rock	54,193	95,227	Malaysia 93,013; Brunei 1,016; United Kingdom 337.
Limestone (except dimension)	14,439	19,517	Malaysia 13,351; Japan 5,924; People's Republic of China 137.
Quartz and quartzite	263	208	Hong Kong 114; United States 59; People's Republic of China 35.
Sand excluding metal bearing	30,626	31,472	Malaysia 28,509; United States 1,947; People's Republic of China 500.
Sulfur:			
Elemental, all forms	10,548	17,309	Canada 9,347; France and Monaco 7,619; West Germany 149.
Sulfur dioxide	27	3	All from United Kingdom.
Sulfuric acid	274	60	Malaysia 41; United Kingdom 7; West Germany 6.
Talc, steatite, soapstone and pyrophylite	5,042	6,387	People's Republic of China 4,571; India 507; North Korea 340.
Other:			
Crude	21,475	77,227	United States 38,965; Peru 10,897; United Kingdom 7,161; Australia 5,289.
Slag, dross and similar waste not metal bearing	46	138	Taiwan 100; Malaysia 21; India 17.
Oxides, hydroxides and peroxides of magnesium, strontium and barium	9	48	Japan 25; United States 18; West Germany 4.
Building materials of asphalt, asbestos and fiber, cement and unfired nonmetals n.e.s	8,990	12,960	Malaysia 10,780; Israel 1,054; United States 362.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	57	20	All to the British Carribbean Federation.
Carbon black	3,710	3,587	Japan 2,238; United States 536; Australia 354.
Coal and coke including briquets	4,239	5,773	Taiwan 3,597; Netherlands 836; New Zealand 477.
Hydrogen, helium and rare gases value, thousands	$212	$276	Malaysia $114; Japan $96; United States $14.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	69,724	80,159	Kuwait 56,752; Iran 8,595; Saudi Arabia 7,722; Sarawak 5,793.
Petroleum refinery products:			
Gasoline:			
Aviation do	3,882	2,216	Iran 1,445; Netherlands Antilles 538; Sarawak 128.
Motor do	r 4,827	5,315	Iran 2,438; Malaysia 1,163; Australia 999.
Kerosine do	2,317	2,315	Malaysia 1,518; Saudi Arabia 276; Iran 211.
Jet fuel do	10,839	10,681	Malaysia 6,206; Iran 2,370; Australia 851.
Distillate fuel oil do	10,843	11,748	Kuwait 2,764; Iran 2,091; Malaysia 1,662; Philippines 1,580.
Residual fuel oil do	29,363	35,178	Malaysia 10,362; Bahrain 6,591; Kuwait 6,403; Iran 2,995.
Lubricants do	1,319	1,445	Netherlands Antilles 635; Japan 436; Netherlands 131.
Mineral jelly and wax do	39	26	Burma 17; People's Republic of China 5; United States 3.
Other do	r 384	332	Iran 138; Saudi Arabia 59; Japan 35; Netherlands 21.
Total do	r 63,813	69,256	

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r Revised. NA Not available.
[1] Less than ½ unit.

Esso Singapore Private Ltd. inaugurated its new $70 million, 81,000-barrel-per-day refinery on Pulau Ayer Chawan in early 1971. This has been built on 250 acres of land, more than one half reclaimed from the swamps and the sea. This ultramodern refinery can vary products to adjust to changing demand. Its lubricants plant is the largest in Southeast Asia. A commercial shipping channel, Selat Pesaw, has been dredged to allow 250,000-deadweight-ton tankers to sail within 3 miles of Pulau Ayer Chawan where there is a unique single buoy mooring terminal connected to the island's storage tanks by a 44-inch pipe that can discharge 12,000 tons of crude oil every hour. Esso has since announced plans to enlarge the refinery by about 150,000 barrels at a cost of possibly $60 million to be completed by the end of 1973. Ishikawajima-Harima Heavy Industries of Japan will build the new facilities.

Another U.S. company, the Mobile Oil Singapore Pte. Ltd., has embarked upon a program to increase refinery capacity from 27,000 barrels per day to 175,000 barrels by 1975, at a cost of $50 to $60 million. Located in the Jurong Industrial Estate, the refinery will be expanded by 75,000 barrels during the first phase ending 1973. The Japanese firm Chiyoda Chemical Engineering & Construction Co. will be the principal contractor in building the new facilities.

British Petroleum Co.'s BP Refinery Singapore Pte. Ltd., with only a small 25,000-barrel-per-day refinery on the Singapore "mainland" at Tanjong Pagar, cannot consider major expansion of facilities, because of land limitations. BP's investment in Singapore, however, already totals $20 million. A 10,000-ton-per-year LPG plant was completed at Jurong in late 1971.

A fifth refinery, rated at 65,000 barrels per day, will be completed on the island of Pulau Marlimau by the end of 1973 at a cost of nearly $70 million. The location of this refinery is south of the Jurong Industrial Estate and adjacent to Esso's refinery. The Singapore Petroleum Co., a joint venture of two U.S. firms[19] and the Development Bank of Singapore, was formed to operate the refinery. Construction will be by the Japan Gasoline Co. jointly with C. Itoh & Co. Principal equipment will include a 70,000-barrel topper, a 21,000-barrel kerosine and gas oil hydrosulfurizer, and a 22,000-barrel gas-oil hydrodesulfurizer. The refinery will meet strict antipollution standards. Most of the output will be exported to Japan through C. Itoh.

Serious efforts were being made to establish a petrochemical industry, to utilize the country's low-cost naphtha. Japan's Sumitomo Chemical Co., Ltd., was one of the interested foreign companies, and Pulau Ayer Merbau, near all the refineries, has been suggested as a possible location for a petrochemical complex.

Singapore services most tankers bringing oil from the Middle East to the Far East. A 210,000–deadweight–ton tanker belonging to Shell ran aground in Singapore. This is about the largest size tanker that can pass through the Malacca Straits, and there was talk about banning tankers of more than 200,000-deadweight tons to prevent future oil spillage.

Singapore has developed into a regional base for petroleum-related activities throughout Southeast Asia. Exploration activities onshore and offshore in Indonesia and, to a lesser extent, Malaysia and Thailand have brought in many oil companies, geophysical surveyors, drilling firms, and companies specializing in construction, supply, and equipment. Early in the year Le Tourneau Co. laid the keel for an offshore drilling platform, and Bethlehem Singapore Shipyard started to build many kinds of small craft for supporting offshore oil operations.

NORTH VIETNAM [20]

North Vietnam in 1971 directed its industry and manpower toward restoring the economy to at least the pre-1965 level. The Government effort, however, was hampered by the war and by one of the worst floods in the country's history.

Emphasis was placed on developing key industries such as building materials, coal, electricity, fertilizers, and machinery. Claims were made for increases of 34 percent in electricity output, 22 percent in coal output, 23 percent in fertilizer output, and 38 percent in cement output in 1971, compared with outputs in 1970. In addition, the volume of earth and stone removed by stripping at coal mines was reported as being nearly twice the volume removed in 1970.

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[19] Standard Oil of Indiana represented by Amoco International and U.S. Summit Corporation represented by Oceanic Petroleum Co.

[20] Prepared by Arthur C. Meisinger, industry economist, Division of Nonmetallic Minerals.

No trade figures were published by North Vietnam in 1971, but the Soviet Union and the People's Republic of China (PRC) continued to be the country's principal trading partners.

COMMODITY REVIEW

Metals.—North Vietnam's metallic mineral production has not been reported in recent years. Various references, however, indicated that the Co Dien chrome mine, the Trai Cau iron mine, and the Cao Bang tin mine were all operational in 1971. Owing to the war situation, the country's ferrous and nonferrous metal requirements continued to be supplied primarily through imports—particularly from the Soviet Union.

Nonmetals.—North Vietnam's cement industry in 1971 continued to operate under wartime difficulties. Annual cement output, believed to be around 500,000 tons for the past several years, was claimed to have been increased by 38 percent in 1971. The Haiphong cement plant accounted for most of the country's cement production.

North Vietnam possesses substantial reserves of phosphates. The most important deposits crop out northwest and southeast of Laokay, in northern Tonkin, along a belt parallel to the border with the PRC.

Large-scale exploitation was started in 1957 following reconstruction of the Laokay apatite mine with financial and technical aid from Romania. Between 1960 and 1964 mine output was increased from 490,000 tons to 930,000 tons, and a production goal of 1.4 million tons was planned for 1965.[21] Construction of a complete phosphate beneficiation plant was also planned in 1965 as part of a Romanian assistance program with North Vietnam.

During 1966–71, production capacity of the Laokay mine was reduced as a result of serious bomb damage, and annual output probably did not exceed 700,000 tons. Following reactivation of the mine in late 1970, mine shipments were resumed and were continued in 1971. No data are available on production of apatite from North Vietnam, but it is believed that significant quantities are exported to the PRC and North Korea. North Vietnam also shipped a small amount of apatite (1,400 tons) to Japan in 1971.

Mineral Fuels.—North Vietnam's coal (predominantly anthracite) production in 1971 was claimed to have increased 22 percent over the planned production norms in 1970. Output of anthracite, primarily from the Hongay mines, was about 5 million tons in 1965, but owing to war damage in 1967, annual output has declined to an estimated 3 million tons in recent years.

High-quality anthracite is annually exported by North Vietnam to many countries. In the more advanced countries, Hongay anthracite is used by chemical enterprises in the manufacture of synthetic dyes and pharmaceuticals, and by metallurgical industries as a substitute for coking coal. Japan received approximately 410,000 tons of North Vietnamese anthracite in 1971 compared with 227,000 tons in 1970.

SOUTH VIETNAM[22]

The war continued to affect the general economy of South Vietnam in 1971. War-related industries were the main contributors to the country's gross national product (GNP), but most of them had little relationship with minerals.

The country's mining, metallurgical, and chemical industries have not been developed to any extent; thus most of the fertilizers, iron and steel products, nonferrous metals, and petroleum products continued to be imported to meet domesitc requirements. Petroleum imports were substantial during the year.

Known mineral production, as in 1970, was limited to cement, clay, salt, sand and gravel (including silica sand), and stone. Output, however, was only reported for cement, salt, and silica sand. The cement industry, relatively small by international standards, showed a slight decline in production, and this necessitated more imports. Some industrial progress was made during the year in the fields of bricks, plastics, ceramics, and chemicals.

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[21] British Sulphur Corporation Limited. World Survey of Phosphate Deposits, North Vietnam. 3d ed., 1971, pp. 163–165.

[22] Prepared by Arthur C. Meisinger, industry economist, Division of Nonmetallic Minerals.

COMMODITY REVIEW

Metals.—The country's domestic requirements for manufactured steel products continued to be supplied mainly by imports in 1971. The value of iron and steel mill products, nonferrous metals, and metal manufactures imported in 1970 was $46.4 million, $7.5 million, and $3.4 million, respectively; final values for 1971 were not available.

South Vietnam's small commercial steel fabricating industry (two rolling mills at Bien Hoa and Thu Duc and a sheet metal plant at Phong Phu) utilized military scrap metal as raw material to produce 75,000 tons of billet steel, reinforcing bars, galvanized sheets, tubes, and wires in 1971. Plans to double the 1971 output were being considered for 1972.

Nonmetals.—The quantity of cement produced in 1971 was 263,000 tons compared with 280,000 tons in 1970.

The planned extension to the Ha Tien cement plant to increase production capacity from 300,000 tons per year to 900,000 tons per year was delayed. An alternate project was under study, however, in which the Ha Tien plant extension would be abandoned and two new cement plants would be constructed at Can Thou and Hue. Each plant would have a cement production capacity of 250,000 tons per year. Foreign investment proposals for the establishment of a cement bulk handling and bagging plant at Danang were also under consideration by the South Vietnamese Government in 1971.

Plans for constructing a $50 million plant that would be capable of producing 400,000 tons of fertilizer per year at Can Tho were abandoned owing to financial problems.

South Vietnam also produced clay, lime, salt, sand and gravel, silica sand, and various types of stone for domestic construction materials in 1971. Output, however, was only reported for salt and silica sand. The quantity of salt produced by evaporation of seawater brines in coastal provinces totaled 120,000 tons. Silica sand output amounted to 5,000 tons.

Mineral Fuels.—South Vietnam's only coalfield at Nong Son was worked in 1971 without any major interruptions; however, the quantity of coal produced was not reported.

The continued effect of the war and the lack of available funds curtailed the proposed project for an oil refinery at Nha Trang. The country continued to rely on imports in 1971 to meet all domestic requirements for petroleum products such as gasoline, kerosine, and distillate and residual fuel oils.

In June the South Vietnamese Government officially announced its intention to grant petroleum and exploitation concessions covering an offshore exploration area of 160,000 to 180,000 square miles that extends around the southern part of South Vietnam from the South China Sea to the Gulf of Thailand.

The Mineral Industry of Other South Pacific Islands

By Staff, Bureau of Mines

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BRITISH SOLOMON ISLANDS[1]

There was apparently very little mineral activity on any of the main islands (Guadalcanal, Choiseul, New Georgia, Santa Isabel, Malaita, San Cristobal, Santa Cruz) of the British Solomon Islands Protectorate (BSIP) in 1971. Data on the small amount of gold production from alluvial deposits, mostly on Guadalcanal are shown in table 1.

During 1971 the Solomon Islands Government reached an agreement in principle with the Mitsui Mining and Smelting Co. of Japan for the trial mining of a 30-million-plus-ton bauxite deposit on Rennell Island. The exceptionally low silica content of the bauxite makes it very attractive for ore blending purposes. The Mitsui proposal would have 49 percent of the local subsidiary owned by the Government and calls for a 1- to 2-million-ton-per-year bauxite export business by 1973.

CHRISTMAS ISLAND[2]

Phosphate rock, produced and shipped since 1897, continued to be the only commercial mineral commodity produced on Christmas Island. Production is shown in table 1.

Christmas Island ranks about 10th among the 30 countries that produce phosphate rock. Shipments of phosphate rock in recent fiscal years, by country of destination, are shown in table 2.

Christmas Island has an area of approximately 55 square miles and is located in the Indian Ocean, 225 miles south of Java Head, Indonesia.[3] According to a recent world survey on phosphate, the island's basic volcanic rock is covered with coral limestone upon which irregular patterns of pinnacles have formed and the phosphate deposited between and above the pinnacles. The phosphate extends to the surface and varies in depth from a few feet to over 100 feet; the average thickness is about 20 feet.

Three types of phosphate ore are mined and in descending order of grade they are: C, near the surface; B, the middle layer; and A, the deepest layer and the only one marketed. Scrapers and dozers are used to excavate the C-grade material. Crawler mounted equipment with dragline and clam-shell excavators are used to mine B- and A-grade ores. Trucks transport the

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[1] Robert A. Clifton, chemist, Division of Nonmetallic Minerals.

[2] Donald E. Eilertsen, physical scientist, Division of Nonmetallic Minerals.

[3] The British Sulphur Corp., Ltd. World Survey of Phosphate Deposits. Third ed., 1971, 180 pp.

Table 1.—Other Pacific Islands: Production of mineral commodities

Area and commodity	1969	1970	1971 [p]
BRITISH SOLOMON ISLANDS [1]			
Gold troy ounces	[r] 413	291	444
CHRISTMAS ISLAND [1]			
Phosphate rock (shipments) thousand metric tons	1,243	1,099	985
FIJI ISLANDS			
Cement, hydraulic metric tons	54,563	60,658	78,091
Copper, mine output, metal content (exports) do	428	--	--
Gold, mine output, metal content troy ounces	91,572	103,785	89,129
Lime metric tons	4,477	2,885	--
Manganese ore do	20,790	24,543	7,657
Silver, mine output, metal content troy ounces	37,951	26,640	19,893
Sand and gravel:			
Coral sand cubic meters	67,592	78,856	69,258
Other sand and gravel do	415,628	384,117	262,698
Stone:			
Limestone metric tons	([2])	[3] 4,719	4,621
Other quarried stone cubic meters	243,699	283,696	158,091
NAURU AND OCEAN ISLAND [1]			
Phosphate rock, marketable (exports):			
Nauru thousand metric tons	[r] 2,193	2,114	1,867
Ocean Island do	[r] 565	[r] 506	620
NEW CALEDONIA [1]			
Gioberite metric tons	1,294	1,099	1,432
Nickel:			
Ore:			
Gross weight thousand tons	5,457	7,021	7,570
Metal in ores [4] metric tons	90,475	105,382	102,286
Metallurgical products, nickel–cobalt content:			
Ferronickel [5] do	23,886	27,965	29,881
Matte [6] do	15,909	15,856	16,138
NEW HEBRIDES [1]			
Manganese ore do	--	[r] 15,355	15,002
PAPUA NEW GUINEA [1]			
Copper, mine output, metal content do	1	[r] 1	NA
Gold, mine output, metal content troy ounces	[r] 25,857	[r] 23,798	23,389
Platinum, mine output, metal content do	([7])	--	--
Silver, mine output, metal content do	[r] 17,206	[r] 17,180	17,451

[p] Preliminary. [r] Revised. NA Not available.

[1] Undoubtedly, this area produces crude construction materials (common clays, sand and gravel, and stone) in addition to the listed commodities, but output is unrecorded and information is inadequate to make reliable estimates of output levels.

[2] Tonnage data not available; output reported volumetrically—19,025 cubic meters for all purposes.

[3] Quantity reported for lime production only.

[4] Nickel-cobalt content of metallurgical plant products plus estimated recoverable nickel-cobalt in exported ores.

[5] Ferronickel averages 23.95 percent combined nickel-cobalt.

[6] Matte averages 78.57 percent combined nickel-cobalt.

[7] Less than ½ unit.

Table 2.—Christmas Island: Shipments of phosphate rock

(Metric tons)

Destination	Fiscal year		
	1969	1970	1971
Australia	883,667	751,575	658,894
Cambodia	--	7,503	--
Indonesia	--	686	11,763
Malaysia	--	68,319	74,976
New Zealand	261,231	258,305	241,797
Singapore	98,431	12,340	15,506
Total	1,243,329	1,098,728	1,002,936
Value of total thousand U.S. dollars	$11,895	$10,482	$8,750

Source: The British Phosphate Commissioners, Melbourne, Australia.

ores to their respective stockpiles. A-grade ore is hauled by rail to the plant where the ore is dried and then shipped by boat to markets.

A report published in 1971 listed the phosphate reserves on Christmas Island as follows: 28 million tons of C-grade ore, mostly crandallite and millisite, assaying about 28.5 percent P_2O_5 and 33 percent R_2O_3 (iron and aluminum oxides); 25 million tons of B-grade ore, a mixture of apatite, crandallite, and millisite, containing about 35 percent P_2O_5 and 17 percent R_2O_3; and 30 million tons of A-grade ore, mostly apatite, assaying approximately 38 percent P_2O_5 and 4 percent R_2O_3. Although the estimates were made in 1959, they show the need for research to develop uses for B- and C-grades of ores which currently are wasted. A wash-screen process was developed to beneficiate B-grade phosphate. The process separates coarse apatite from small size crandallite and millisite. The apatite concentrate is marketable phosphate; recoveries ranged between 50 and 60 percent.[4]

Sodium hydroxide solutions, at about 80° C, rapidly decompose crandallite and millisite in B- and C-grade ores. The reaction produces an insoluble residue of impure, highly reactive apatite that responds favorably as direct application fertilizer. The residue can also be underacidulated to produce a granular form with fertilizer potential. Christmas Island phosphate is also a potential source of smelter-grade alumina.[5]

The mineralogy, mineral chemistry, thermal transformations, and physical properties of C-grade phosphate were discussed at the 1971 annual conference of the Australasian Institute of Mining and Metallury.[6]

The ion exchange, hydrochloric acid, and sulfuric acid-alum processes of producing water soluble phosphate fertilizer from C-grade phosphate were also discussed.[7] The report also included estimated costs of producing fertilizer by the sulfuric acid-alum process using 500 tons of calcined C-grade ore daily.

The calcination characteristics of Christmas Island phosphates,[8] and research on producing superphosphate from Christmas Island phosphate rock was published.[9]

FIJI ISLANDS [10]

Fiji lies at the crossroads of the South Pacific, connecting Australia and New Zealand with North America. About 800 islands and islets, which spread over 250,000 square kilometers of ocean, straddle the 180th meridian but lie west of the International Dateline between latitudes 15 and 20 degrees south. About 100 islands are permanently inhabited and 90 percent of the total land area is taken up by the two largest islands, Viti Levu and Vanua Levu. Suva, the capital city, is located on the main island of Viti Levu and is 2,700 kilometers east-northeast of Brisbane, Australia. Population of the Fiji Islands at the end of 1969 totaled 513,700, of which 219,800 were Fijians and 260,600 were Indians. On October 10, 1970, Fiji achieved independence and acquired dominion status in the British Commonwealth. The transition from a colonial to an independent nation has gone smoothly; this has been reflected by the steady rapid growth and expansion.

Mineral production in 1971 was valued at nearly $7 million[11] of which about 45 percent of the value was accounted for by gold. The major minerals produced according to value were gold, cement, sand and gravel, stone, and manganese ore. Gold production and value were down 14 per-

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[4] Hoare, J. S. Development of Wash/Screen Process to Beneficiate Christmas Island "B" Grade Phosphate. Tech. Paper Pres. at the 1971 Ann. Conf., Australasian Inst. of Min. and Met., 1971, 27 pp.

[5] Rothbaum, H. P. Production of Fertilizers and Smelter-Grade Alumina By Alkali Leaching of Christmas Island "B" and "C" Phosphate Ores. Tech. Paper Pres. at the 1971 Ann. Conf., Australasian Inst. of Min. and Met., 1971, 13 pp.

[6] Trueman, N. A. The Aluminum-Iron Phosphatic Overburden of Christmas Island, Indian Ocean: Its Mineralogy, Mineral Chemistry, and Thermal Transformations. Tech. Paper Pres. at the 1971 Ann. Conf., Australasian Inst. of Min. and Met., 1971, 20 pp.

[7] Allen, R. J. Production of Water-Soluble Phosphate Fertilizer From Christmas Island "C"-Grade Phosphate. Tech. Paper Pres. at the 1971 Ann. Conf., Australasian Inst. of Min. and Met., 1971, 18 pp.

[8] White, M. S. Calcination of Christmas Island Phosphates. New Zealand J. of Sc., v. 14, No. 4, December 1971, pp. 971–992.

[9] White, M. S. Superphosphate from Christmas Island Phosphate Rock. New Zealand J. of Sc., v. 14, June 1971, pp. 364–391.

[10] Herbert R. Babitzke, chemist, Division of Nonferrous Metals.

[11] Where necessary, values have been converted from Fiji dollars (FD) to U.S. dollars at the rate of F1=US$1.1757.

Table 3.—Fiji Islands: Exports and reexports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Aluminum, metal including alloys, all forms	--	36
Copper:		
Ore and concentrate	2,379	--
Matte	--	6
Metal including alloys, all forms	--	191
Gold bullion ... troy ounces	95,346	107,632
Gypsum, anhydrite, etc	--	4
Iron and steel:		
Metal:		
Scrap	1,153	812
Semimanufactures	384	903
Lead, metal including alloys, all forms	--	282
Manganese ore and concentrate	11,295	38,827
Platinum-group metals and silver, waste and sweepings ... troy ounces	--	1,280
Silver (in bullion) ... do	33,698	26,982
Sodium and potassium compounds, caustic soda	--	5
Stone, sand and gravel:		
Gravel and crushed rock	--	152
Sand, excluding metal bearing	--	5
Other:		
Metallic ores and concentrates	142	--
Metal, scrap of nonferrous	4,053	142
NONMETALS		
Cement	10,060	11,125
Fertilizer materials	6	--
MINERAL FUELS AND RELATED MATERIALS		
Coal, briquets and similar solid fuels	1	--
Petroleum, refinery products:[1]		
Gasoline, motor and aviation ... thousand 42-gallon barrels	42	56
Kerosine and jet fuel ... do	567	655
Distillate fuel oil ... do	170	183
Residual fuel oil ... do	106	612
Lubricants ... do	3	3
Liquefied petroleum gas ... 42-gallon barrels	325	267
Total ... thousand 42-gallon barrels	888	1,509
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	565	8

[1] Includes bunkers.

cent from 1970; cement production was up 29 percent from last year.

Mineral development policy is based upon the fundamental concept that the mineral resources of Fiji are owned by the state and should be exploited so as to produce the optimum benefits for the public at large. This policy was established under legislation that goes back to 1908.

For decades it was believed that the geological formations on Fiji were such that the discovery of gold was impossible, but in 1929, an orebody was located at Mt. Kasi in the southern part of Vanua Levu. More discoveries were made in 1932 that led to the development of three famous mines; the Emperor, Loloma, and Dolphin in the Tavua area; but by 1971, only the Emperor mine was in operation. Because the Emperor Gold Mining Co. Ltd. employed a large number of men—1,000 to 1,500 in 1971, mostly Fijians—the Government has assisted the industry from time to time with subsidies, grants, and interest-free loans. The year 1971, had been generally disappointing with the gold mine continuing to operate at a loss, which resulted in continued government subsidy of the Emperor Gold Mining Co. Ltd. The total tonnage milled was a record high although the grade was lower. Gold and silver production in 1971 was 89,129 and 19,893 ounces, respectively.

The second largest metal mining interest has been in manganese found in many parts of Viti Levu. The boom period was 1957 to 1958 when the most easily accessible deposits were worked out. The only operating manganese mines in 1971 were those of Manganex Ltd., which took over from Akhil Holdings Ltd. about 1969. Manganex is a local subsidiary of an Australian company, South Land Mining Co. Ltd. The company's manganese mining activities are in western Viti Levu where the company has six leases.

Copper ore was mined at Udu Point, Vanua Levu, in 1967 and 1968. The depos-

Table 4.—Fiji Islands: Imports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970
METALS		
Copper:		
Matte	2	--
Metal including alloys, all forms	94	12
Gold, metal, unworked or partly worked troy ounces	237	374
Iron and steel:		
Pig iron, ferroalloys, and similar materials	188	--
Steel, primary forms	565	10
Semimanufactures	16,834	8,564
Platinum-group metals and silver, unworked and partly worked value	$5,500	$6,542
Tin metal, including alloys, all forms long tons	284	NA
Titanium oxides	137	138
Other metals, including alloys	28	NA
NONMETALS		
Abrasives, natural, pumice, emery, natural corundum, etc	10	NA
Asbestos	3	1
Barite and witherite	4	5
Cement	312	220
Chalk, earth colors, etc	59	5
Crude clays, n.e.s., kaolin and bentonite, etc	58	27
Diatomite and other infusorial earths	26	18
Fertilizer materials:		
Crude:		
Potassic	131	2
Mixed	61	168
Manufactured:		
Nitrogenous	22,858	24,886
Phosphatic	4,682	3,243
Potassic	323	373
Mixed	68	10
Gypsum and plasters	25	3,572
Lime	73	62
Precious and semiprecious stones, except diamond value	$6,901	$10,804
Salt	2,601	1,127
Sodium compounds, caustic soda	962	713
Stone, sand and gravel:		
Dimension stone	8	NA
Dolomite	20	--
Sand, excluding metal bearing	88	124
Sulfur, elemental, all forms	1	--
Talc and steatite	11	2
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	4	662
Coal, coke and peat	1,403	240
Petroleum, refinery products:		
Gasoline, motor and aviation thousand 42-gallon barrels	283	354
Kerosine and jet fuel do	786	941
Distillate fuel oil do	641	748
Residual fuel oil do	235	3,045
Liquefied petroleum gas do	6	6
Lubricants (including grease) do	20	22
Other do	[1] 12	[1] 17
Total do	1,983	5,133
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals 42-gallon barrels	[1] 655	[1] 862

NA Not available.
[1] Partial figure.

its, which were estimated to last for several years, were depleted after only 16 months of exploitation. However, extensive exploration for copper and other base metals were carried out at Namosi by Central Mining Finance Ltd. and at Wainimala by Longreach Metals N. L. and Falconbridge Pty., Ltd., during 1971.

Bauxite Fiji Ltd., which is a local subsidiary of three Japanese companies: Nippon Light Metal Co., Sumitomo Chemical Co., and Showa Denko K. K., has a mining lease in southwest Vanua Levu. Premining development construction commenced during the year. When completed in 1972, the operation will have an estimated capacity of 300,000 tons of bauxite per year. Shipments of bauxite are expected to be made to Japan early the following year.

In 1971, Barringer Fiji Ltd., a Canadian-based company, obtained prospecting rights and continued exploration for base metals, except manganese, and earthy minerals over a large area of Viti Levu and Vanua Levu.

Two companies were actively engaged in the search for oil and two more companies were obtaining licenses for exploration in 1971. Southern Pacific Petroleum is in its second year of exploration in Bligh Waters. Oxoco Fiji Ltd. is also engaged in the search for oil. The maximum area one oil search company can hold is 7,500 square kilometers. All exploratory areas are offshore.

NAURU AND OCEAN ISLAND[12]

Phosphate rock continued to be the only commercial mineral commodity produced in the Republic of Nauru and on Ocean Island. The rates of production are shown in table 1.

Nauru.—Phosphate rock output has averaged slightly over 2 million tons per year in recent years.

The phosphate mining operations of Nauru were described in detail.[13] Nauru has an area of 8¼ square miles and is located in the Pacific Ocean 32 miles south of the Equator at longitude 166°56′E. Phosphate was first produced on the remote island in 1900. On June 30, 1970, Nauru Phosphate Corp., organized by an act of Parliament, took over all of the phosphate operations from the British Phosphate Commissioners (BPC) and bought the assets for Australian $21 million. At midyear 1970, Nauru had 50.54 million metric tons of phosphate reserves, which, at the current extraction rate, should last about 22 years. Prior to 1970, 46.5 million tons of phosphate was mined. According to surveys made in 1916 and 1931, the deposits contain an average of 84 percent calcium phosphate.

The phosphate lies between pinnacles of coral limestone which number about 260 peaks per acre, the volume of pinnacles occupying about 40 percent of the whole deposit. The ore, extending to the vegetation, is sometimes 80 feet in depth; the average thickness is 25 feet.

Prior to mining, the vegetation and protruding pinnacles are removed, forming a bench 30 to 60 feet wide. Eleven cranes with clamshell buckets excavate the ore, known as raising. Mechanical shovels are used to mine areas where pinnacles terminate several feet below ground level. The rock is loaded into 23 dump trucks (14-ton load), which haul it 1½ miles to the crushing and screening plant. Raising is done 24 hours per day, 6 days per week at an average rate of 7,600 cubic yards per day.

The crushing and screening plant has a capacity of 800 tons of minus 2-inch phosphate per hour; however, the plant is usually regulated to operate at 600 tons per hour. After crushing, the rock is transported 2½ miles by rail to the drying plant for kiln drying. Before drying, the rock contains between 9 and 25 percent moisture, the average being 12 percent. After drying, the rock contains 2 to 4 percent moisture and is ready for shipment by boat to distant markets.

Ocean Island.—Ocean Island is located in the Pacific Ocean about 160 miles east of Nauru. The island is elliptical in shape, measures 1¾ miles by 1½ miles, is less than one-third the size of Nauru, and rises to a height of 250 feet above sea level. Ocean Island is part of the British Colony of Gilbert and Ellice and lies about 300 miles west from center of the Gilbert Islands chain.[14]

Phosphate mining on Ocean Island dates back to 1900. The BPC representing the Governments of Australia, New Zealand, and the United Kingdom have operated the deposit since 1919.

The phosphate deposit on Ocean Island is similar to that on Nauru. Most of the phosphate lies between pinnacles of limestone; however, the pinnacles are larger than those on Nauru and the ore zone is thicker, extending downward 70 to 80 feet.

Some of the phosphate is hard rock, but most is alluvial consisting of small phosphatized limestone fragments and reef debris, together with phosphate dust. About 12 million tons of phosphate was produced during the first 60 years of operation. In 1968, the reserve of minable phosphate containing 36 to 42 percent P_2O_5 was reported at 5 million tons. At the present rate of production, the reserve will last until 1979.

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[12] Donald E. Eilertsen, physical scientist, Division of Nonmetalic Minerals.

[13] Webb, B. J. Mining and Handling of Nauru Phosphate Rock. Paper No. 1, Tech. Paper Pres. at 1971 Ann. Conf., Australasian Inst. of Min. and Met., 1971, 27 pp.

[14] The British Sulphur Corp., Ltd. World Survey of Phosphate Deposits. Third ed., 1971, 180 pp.

Phosphate rock output has averaged slightly over 514,000 tons per year in recent years.

Phosphate mining in Ocean Island is practically the same as on Nauru. The hard phosphate has to be broken by drilling and blasting. Clamshell excavating equipment is used to excavate the ore between the pinnacles and load it into trucks for transport to the crushing and drying plant at Home Bay. There, the wet ore, containing 12 to 18 percent moisture, is crushed to minus 2-inch size and conveyed to rotary kilns for drying and reducing the moisture content to less than 4 percent. This product, together with compacted dust, is conveyed to storage until shipped by boat to consumers in Australia, New Zealand, and the United Kingdom.

NEW CALEDONIA[15]

New Caledonia, belonging to France, again ranked second in free world production of nickel in 1971. The territory, although hampered by a 2-month's labor strike at Société le Nickel S. A. operations and Japan's pressure to lower imports of nickel ore, produced approximately the same quantity of nickel in 1971 as in 1970. Eagerness to develop New Caledonian nickel laterite deposits subsided in 1971 as a result of surplus nickel in world markets. Nevertheless, at yearend International Nickel Co. of Canada Ltd. (Inco), the principal factor in Compagnie Française Industrielle et Minière du Pacifique (COFIMPAC), was negotiating with the French Government for alternative nickel resource developments but on a smaller scale and with a broader financial base than originally sought.[16]

PRODUCTION

Production of nickel ore increased in 1971, reaching 7.6 million tons, compared with 7.0 million tons in 1970. Nickel ore production in New Caledonia has increased 162 percent since 1966. Le Nickel remained the island's principal nickel producer. Its Doniambo refinery produced 46,020 tons of nickel in 1971 (16,138 tons in matte and 29,881 tons in ferronickel), compared with 43,821 tons of nickel in 1970 (15,856 tons in matte and 27,965 tons in ferronickel).

Small quantitites of giobertite (1,432 tons) and jade (550 kilograms) also were produced during the year.

TRADE

The value of mineral exports from New Caledonia totaled $195.8 million in 1971, compared with the previous year's total of $189.1 million. Exports of nickel ore, mainly to Japan, totaled 3.8 million tons, down approximately 7 percent from the previous year's total of 4.1 million tons. The nickel content of ore exported continued to decline from 2.5 percent in 1970 to 2.45 percent in 1971. Exports of ferronickel and matte during 1971 totaled 44,848 tons; 29,051 tons of ferronickel and 15,796 tons of matte. Most of the ferronickel (70 percent) and matte (73 percent) exported went to France. The remaining 30 percent of ferronickel went to the United States.

Table 5.—New Caledonia: Exports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1969	1970	1971
Nickel ore ... thousand tons	3,093	4,127	3,832
Smelter products, nickel-cobalt content:			
Ferronickel:			
Electric grade (FN4 grade, 25.1 percent nickel-cobalt)	8,467	11,126	11,042
Sulfur extracted grade (FN3 grade, 24.5 percent nickel-cobalt)	5,764	7,325	9,006
Refined grade (FN2 grade, 26.3 percent nickel-cobalt)	411	1,130	557
Overrefined grade (FN1 grade, 27.5 percent nickel-cobalt)	9,550	8,405	8,446
Matte, nickel matte (79 percent nickel-cobalt)	15,649	15,627	15,796

Source: Mines Service of New Caledonia.

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[15] John D. Corrick, physical scientist, Division of Ferrous Metals.

[16] International Nickel Co. of Canada Ltd., 1971 Annual Report.

Table 6.—New Caledonia: Imports of selected mineral commodities
(Metric tons)

Commodity	1969	1970	1971
METALS			
Unwrought and semimanufactures, not further specified	24,234	NA	NA
NONMETALS			
Cement, hydraulic	58,484	105,949	124,606
MINERAL FUELS AND RELATED MATERIALS			
Coal and coke	199,472	258,403	210,914
Petroleum refinery products	278,918	459,589	518,978

NA Not available.

COMMODITY REVIEW

Metals.—*Nickel.*—A 2-month strike at Le Nickel's operations during 1971 resulted in the company failing to produce the predicted 60,000 tons of nickel. However, Le Nickel was able to nearly equal 1970's production, despite the strike, as a result of starting up another 33,000-kilowatt electric furnace at the Doniambo smelter. The new furnace was part of a joint venture between Le Nickel and Kaiser Nickel Co. The new facility was planned to produce an additional 30,000 tons of nickel per year with each partner getting 50 percent of its output. The strike was settled when Le Nickel offered to calculate long-term service bonuses on take-home pay rather than basic pay and grant free round trip fares to France for personnel on 45-day leave that had been with the company for over 20 years. Production losses caused by the strike were estimated on the order of 10,000 tons of nickel. The sinking of a freighter in the Atlantic Ocean carrying 1,200 tons of nickel matte and 5,600 tons of ferronickel added to Le Nickel's problems. The freighter was on the last leg of a journey from New Caledonia to Le Havre, France, when a storm struck and caused the cargo to shift sinking the ship; 38 of the 39-man crew were lost.

Le Nickel's attempt to obtain approximately $120 million in financing from Japanese steelmaking and nickel smelting firms in return for the long-term supply of 20,000 tons per year of ferronickel from its newly proposed 40,000-ton-per-year plant at Poum ran into difficulties. Officials of the Japanese companies were reportedly reluctant to lend Le Nickel $120 million in view of the prevailing market. A new company formed to operate the Poum development, Société Métallurgique Calédonienne, was to be composed of the Patino Mining Corp. through its French subsidiary, Compagnie Française d' Entreprises Minières Métallurgiques et d' Investissements (holding 30 percent of the shares in the company and lending $20 million for smelter construction), and Le Nickel (51 percent and manager of the company). The remaining shares were to go to local New Caledonian and French companies and individuals. These companies along with Le Nickel would supply 50 percent of the ore for the smelter. Smelter production was planned to start in late 1973, utilizing three electric furnaces similar to those at Doniambo. Garnierite ore was to be smelted, and the laterite overburden stockpiled for future treatment. Le Nickel's garnierite reserves on New Caledonia were estimated at over 150 million tons, assaying 2.5 percent nickel, and over 1 billion tons of laterite, assaying 1.3 percent nickel.

A proposed 50,000-ton-per-year nickel pellet project of COFIMPAC was cancelled because French concerns were not prepared to embark on such a large scale project. COFIMPAC was originally to be financed 40 percent by Inco and 60 percent by Société Auxiliaire Minière du Pacifique. COFIMPAC held reserves of more than 500 million tons of laterite ore containing 1.57 percent nickel. Inflation raised the estimated cost of the proposed refinery from the original $491 million to nearly $600 million by the start of 1971. At yearend, Inco was attempting to secure from the French Government, rights to develop other nickel resources on a smaller scale and a wider financial base than originally proposed.

The joint American Metal Climax Inc. (AMAX) and Société Minière et Métallurgique de Peñarroya S. A. Port Boise nickel project proceeded on schedule in 1971. AMAX held 49 percent and Peñarroya 51 percent interest in the newly founded PENAMAX company. PENAMAX's goal was the production of 50,000 tons of nickel plus cobalt per year starting in 1975. Drilling had disclosed ore reserves of 250 million tons averaging 1.4 percent nickel. Metallurgical testing was conducted during 1971 in France while AMAX tested the ore in a pilot plant at its extractive metallurgical laboratory in Golden, Colo. Ten thousand tons of the New Caledonian ore was shipped to Golden for test purposes during the year.

The Australian company, Palgrave Corp., Ltd., hired consulting metallurgists to design a 15,000-ton-per-year ferronickel smelter to be built on New Caledonia. Palgrave and local claim holders (members of Le Syndicat Independent des Mines) prospected for nickel deposits during much of 1970 and 1971 and reported reserves totaling 3.0 million tons averaging 2.43 percent nickel. Unproven areas were estimated to contain 6 million tons of ore. Probable tonnages of ore that can be economically mined were estimated at 650,000 tons averaging 2.38 percent nickel. Jean Claude Berton, a member of Le Syndicat, announced that he was closing down his mining activities in New Caledonia. The reason for terminating operations was failure to obtain permission from French authorities to export 200,000 tons of 2.3-percent nickel ore to Japan. French authorities made it clear they preferred independent miners to process ore on the island and thereby encourage installation of new plants and create jobs.

NEW HEBRIDES[17]

The Forari mine on Efate (Vate) Island reopened in 1970 under new owners, and limited production was still continuing in 1971. Le Manganese de Vate (LMV), the owning company, exported their entire production of 44 percent concentrated manganese ore. Production and exports in the 1963–71 period were as follows:

Year	Production	Exports
1963	25,416	23,319
1964	60,546	66,104
1965	67,710	81,650
1966	76,240	65,145
1967	71,400	72,146
1968	55,000	45,000
1969	--	--
1970	15,355	28,543
1971	15,002	14,910

PAPUA NEW GUINEA[18]

Mineral production of the Australian administered Territory of Papua New Guinea (formerly Papua and New Guinea), including Bougainville, New Britain, New Ireland, Manus, and other islands remained small in relation to the total territory income. Statistical data for 1971, indicate that mineral production consisted primarily of small quantities of gold and silver with a combined value of $897,900. The territory has great mining potential, however, and geologists estimate that it could contain one of the world's richest mineral belts.

Large expenditures on mineral exploration activities continued and most of the territory is now covered by mining leases. Explorations, surveys, and development work were made in many parts of Papua New Guinea, but there were areas where activity was particularly intense. The greatest of these was the Bougainville copper project, which is scheduled to come into full production during the second quarter of 1972. Annual output will be 152,000 tons of copper in concentrate, 1,000,000 ounces of silver, and 500,000 ounces of gold.

Apart from the Bougainville copper project, Kennecott Copper Corp. was investigating copper deposits in the west Sepik districts of Papua. These deposits were evaluated and appear to contain high-grade ore. A copper deposit was also investigated near the Freda River in the highlands of New Guinea. Exploration has been going on for several years, and indications reportedly were good.

Although feasibility has yet to be finally established and a market secured, if either of the western Papua or the Freda River developments turn out to be one-half the size of the Bougainville deposit, as has been estimated, major changes will be made in the local economy and in the outlook for the economy of the Papua New Guinea mainland.

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[17] Robert A. Clifton, chemist, Division of Nonmetallic Minerals.

[18] Charlie Wyche, physical scientist, Division of Nonferrous Metals.

In addition, a small copper mine at Laloki near Port Moresby is expected to begin production next year, with an output worth $1 million per year over a 6-year period.

Five companies were showing interest in substantial deposits of iron-bearing beach sands along the Papuan coast and in the Madang District. Also, large deposits of high-grade limestone were found near Lae, and bauxite was found on an island in Milne Bay and near New Ireland.

The search for oil continued, and the Government asked for bids on five additional offshore exploration areas in late December. About $10 million was spent on petroleum exploration during the year, and this is expected to increase to $20 million per year by 1974.

PRODUCTION

Mineral production for Papua New Guinea is shown in table 1.

COMMODITY REVIEW

Metals.—*Copper.*—The $475 million Bougainville copper project in the Australian administered Territory of Papua New Guinea will come into full production in April 1972. The operating company, Bougainville Copper Pty. Ltd. (BCP), holds long-term contracts for the sale of 147,000 tons of contained copper each year. Of this total, 86,000 tons will go to a consortium of seven Japanese smelters, 47,000 tons to Norddeutsche Affinerie of Hamburg, and 14,000 tons to Rio Tinto Patino in Spain. The Papua New Guinea administration has a 20-percent share in BCP and is expected to earn between $350 and $470 million from the mine in taxes, royalties, and dividends in its first 10 years of operation. The remaining 80 percent is owned by Bougainville Mining Ltd., in which the interests are held 66⅔ percent by Conzinc Rio Tinto of Australia Ltd. (CRA), and 33⅓ percent by New Broken Hill Consolidated Ltd.

The mine is located in the mountainous terrain at Panguna on Bougainville Island. The deposit is a high-sulfur porphyry copper type, situated in the Kawerong Valley on the western fall of the Crown Prince Range in south central Bougainville. Chalcopyrite is the dominant primary copper mineral, occurring principally in the andesite, in and about the leucocratic quartz diorite and in the biotite diorite. The chalcopyrite is accompanied in places by bornite and a little molybdenite, silver, and gold. The silver-gold content varies with the copper content, and pyrite is widely distributed. Reserves in the higher grade portion of the deposit have been estimated at 772 million tons containing 0.47 percent copper and 0.02 troy ounce of gold per ton. An additional 400 million tons of low-grade ore is adjacent to the main body.

Approximately 500 acres of thick jungle was cleared away, and 16 million cubic yards of overburden and 40 million tons of waste material was removed. Work was completed on most of the major components of the project at yearend. This includes two towns, port facilities, a power station, crushing plant, and the mine concentrator. The crusher and concentrator equipment will process 81,300 tons of ore per day. The concentrate, mixed with water, will be pumped by pipeline to the port at Anewa Bay. Port loading facilities are designed to handle about 12,200 tons per hour of concentrate. Future plans include the possibility of adding a smelter.

The company announced during the year that it had received a request to consider a contribution towards the cost of antipollution measures found necessary by the smelters using its concentrates. The request in the case of Japan would reduce the effective price received by Bougainville Copper for concentrates by up to 1.5 cents per pound of contained copper.

Manus Island Consortium reported the presence of a porphyry copper deposit on the Arie prospect on Manus Island in New Guinea. The consortium announced that two vertical drill holes located about 328 feet apart had intersected 917 feet and 977 feet of continuous disseminated copper sulfide mineralization in highly fractured quartz diorite. Both holes stopped in copper mineralization and core recovery in both holes was described as excellent. The company has commenced work on a third drill hole.

McKee Pacific Pty. Ltd. was awarded a contract by Kennecott Pacific Pty. Ltd. for engineering feasibility studies as part of Kennecott's continuing evaluation of the Ok Tedi copper prospect in Papua New Guinea. Although no official estimates have been made, Kennecott is said to have encountered copper grades ranging from 0.5 percent to as high as 2.5 percent but averaging around 1 percent. The engineering studies will include mine facilities, townsites, access roads, transportation, power generation, and port works.

Iron Sands.—Industrial Mining & Investment has spent $400,000 on exploration of an iron sand deposit on the Gulf of Papua. Exploration is still continuing, and the venture has already attracted keen interest from Japanese ore buyers.

A group of international metal producers have reportedly retained a Japanese consultant to investigate the feasibility of harnessing the hydroelectric potential in Papua New Guinea to supply power to a major aluminum smelter there. Bauxite would be readily accessible from either the Australian mainland or from the British Solomon Islands. The project could also involve a copper smelter to process copper ore from CRA's Bougainville mine; since in its agreement with the Government, CRA is pledged to investigate such a possibility.

Nickel.—A lateritic nickel deposit was found by Amax Mining of Australia in the Sofia area, northeast of Port Moresby. Although the deposit looked promising, Amax abandoned the area in favor of the more financially pressing nickel interests on the Australian mainland.

Mineral Fuels.—*Petroleum and Natural Gas.*—Early in 1971 Eastern Marine Associates signed with Continental Oil for a minimum of 500 miles of offshore and river reconnaissance work in the P43 license area of Papua. Eastern Marine said both seismic reflection and refraction work is going on in the area, including the Large Fly and the Aramia rivers.

About the same time it was announced that a three-company group headed by General Crude Oil had received a farmout from Continental Oil, Cities Service, and Japex, covering 20,000 square miles along the northern coast. General Crude and Newmont Oil each have a 35-percent interest, and Offshore Oil has the remaining 30 percent. Wildcat drilling began during the last quarter of 1971.